

Echo Plate Audit Application



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Beckman Coulter, Inc.
250 S. Kraemer Blvd.
Brea, CA 92821 U.S.A.



Echo Plate Audit Application

User Guide

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- Outside of the USA and Canada, contact your local Beckman Coulter Representative.

Glossary of Symbols is available at beckman.com/techdocs (PN C24689).

May be covered by one or more pat. - see www.beckman.com/patents

Original Instructions

Revision Status

This document applies to the latest software listed and higher versions. When a subsequent software version changes the information in this document, a new issue will be released to the Beckman Coulter website. For labeling updates, go to www.beckman.com/techdocs and download the most recent manual or system help for your instrument.

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This section provides information about who the intended audience is, the software requirements, technical support resources, and documentation conventions used. It includes the following sections.

- [About this Guide](#)
- [Intended Audience](#)
- [Software Requirements](#)
- [Technical Support Resources](#)
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About this Guide

This guide describes the key features of the Echo Plate Audit application.

Intended Audience

The intended audience for this guide is laboratory personnel. Researchers can use the Echo Plate Audit application to create and run “survey only” plate transfer protocols for Echo Liquid Handlers.

Software Requirements

To use the Echo® Plate Audit Application, the following items are required:

- Echo Liquid Handler instrument using server version 2.4.x or later and Echo.Net Framework version 1.8.0
- Software license key from Beckman Coulter Inc.
- Computer system meeting the following requirements:
 - **Operating system:** Microsoft Windows 10 64-bit, (must be run in Windows 7 Compatibility Mode); Microsoft .Net Framework 4.6
 - **NOTE** Echo Plate Audit Application will run in 32-bit mode on Windows 10 64-bit Operating System.
 - **CPU:** Intel® Core™ i5 or later
 - **Memory:** 4 GB or greater
 - **Network connection:** 2 x 10/100/1000 BaseT

- **Network protocol:** TCP/IP
- **Hard drive:** 4 GB Free Space Available
- **Video:** Minimum 1600 x 1200 resolution

The Echo Plate Audit Application works closely with the Echo Liquid Handler Software for Client Computers and should be installed on the same client PC.

The Echo Software Compatibility Matrix table below documents the versions of software supported by this guide and their compatibility.

Echo Software Version Compatibility Matrix

Echo Client Software	Echo Application Software	Tempo Automation Control Software	Echo.Net Framework
2.4.5 - 2.5.x	1.5.4 or later	1.5.2 or later	1.5.4 or later
2.4.5 - 2.6.x	1.6.0 or later	1.6.0 or later	1.6.0 or later
2.4.5 - 2.6.x	1.7.0 or later	2.1.x ^a or later	1.7.0 or later
3.1.x	1.7.2 or later	2.1.x ^a or later	1.7.2 or later
2.4.5-2.6.x	1.8.0 or later	2.2.0 or later	1.8.0 or later
3.1.x	1.8.0 or later	2.2.0 or later	1.8.0 or later

a. Check with your Beckman Coulter Sales Representative for availability.

NOTE For information on the compatibility of a specific software version, please [contact us](#).

Customer Responsibilities

The customer is responsible for installing, configuring, and securing the Windows 10 operating system on their computer, including the creation of any user accounts and password complexity rules that may apply, and the application of any software patches and security updates that are necessary to keep the system secure. The customer is also responsible for installing anti-virus and anti-malware software and keeping the virus definitions from the vendor up to date so as to keep the computer safe.

The Echo application software accepts certain inputs, such as Sample ID and Sample Name, which the user might populate with personally identifiable information. Furthermore, the Echo application software uses those inputs to generate reports that are stored unencrypted on the disk. Accordingly, it is the responsibility of the customer to ensure that the information provided to the Echo application, and subsequent reports that are stored on the disk, do not contain any personally identifiable information, or that the information is obfuscated or encrypted when stored on the disk to comply with any applicable regulations related to data privacy and security.

Technical Support Resources

For technical support issues, contact Customer Service www.beckman.com/support/technical.

For telephone support, call (877) 742-6548.

Documentation Conventions

Style	Purpose
<i>blue italicized text</i> (PDF, Web only)	Cross references, link, Web addresses
<i>courier std</i>	Commands, filenames, directories, paths, user input
bold text	Interactive interface objects, keys, buttons
<i>italicized text</i>	Book titles, glossary terms

Introduction

The Echo Plate Audit application enables the creation and analysis of survey data from the Echo Liquid Handler without fluid transfer. All plates processed in an Echo Plate Audit protocol are treated as source plates and surveyed according to the plate type selected. After plates are surveyed, the analysis view in Echo Plate Audit enables data visualization for easy comparison of fluid properties.

Since the Echo Liquid Handler has the capability to survey and assess the composition of fluid in a microplate well, the Echo Plate Audit application can use this capability to collect and present the sample properties for analysis. Characteristics including fluid height, volume, and composition can be visually compared to benchmarks or across replicates. Additionally, wells with low sample volume are easily identified for replenishment. Analysis rules can be created to quickly assess samples across plates and qualify sample plates for protocols run on Access workstations. In Tempo automation control software, plates that violate a validation rule can be flagged to prevent use in a future run or to simply warn operators.

The key features of this application are described below:

- Side-by-side comparison for reports from multiple runs
- Ability to analyze plate-to-plate variations within a batch
- Allows the setting of volume and composition thresholds to identify failing wells
- Ability to create pass and fail rules
- Ability to set benchmarks and compare plates over time
- Create rules to quickly assess samples across plates
- Use rules to validate samples for screening

The steps to creating a typical transfer protocol for Echo Plate Audit Application are shown below.

- 1** Start a new protocol. For more information, see [Starting a New Protocol](#).
 - 2** Select the source plate type. All protocols start with this step. For more information, see [Selecting the Source Plate Type](#).
 - 3** Select the survey area. For more information, see [Selecting the Survey Area](#).
 - 4** Create custom rules. For more information, see [Rule Definitions](#).
-

-
- 5** Edit the protocol. For more information, see [Editing the Protocol](#).

 - 6** Run the protocol. For more information, see [Running a Protocol](#).

 - 7** View reports. After the protocol run is completed, the .epadata file is displayed with the resulting survey data. For more information, see [Viewing Reports](#).

 - 8** Save the protocol and survey data set.
-

CHAPTER 3

Getting Started

This chapter describes the basic tasks to start, set up, and exit the Echo Plate Audit application. It includes the following topics.

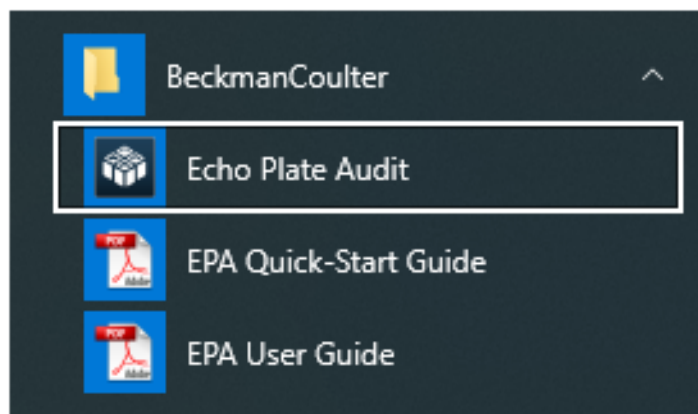
- [Starting the Software](#)
- [Activating the Instrument](#)
- [Understanding the Main Window](#)
- [Setting Up the Software](#)
- [Shutting Down the Software](#)

Starting the Software

To start the Echo Plate Audit application:

- 1** Open the **Start** menu.
 - 2** Select **All Programs (or Programs) > BeckmanCoulter > Echo Plate Audit**.
 - 3** Select the **Echo Plate Audit** application.
-

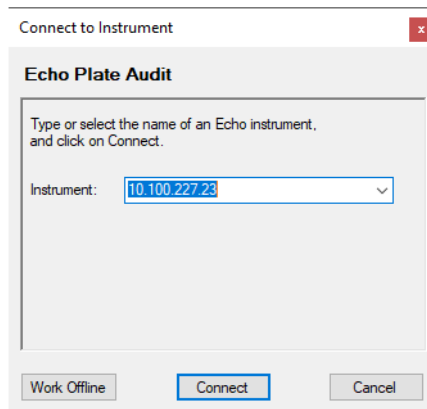
Figure 3.1 Location of Echo Plate Audit application



NOTE To create a shortcut to the **Echo Plate Audit** application on the computer desktop, right-click on the **Echo Plate Audit** icon and select **Send to** and **Desktop**.

After launching the application, the Connect to Instrument prompt is displayed.

Figure 3.2 Connect to instrument dialog box



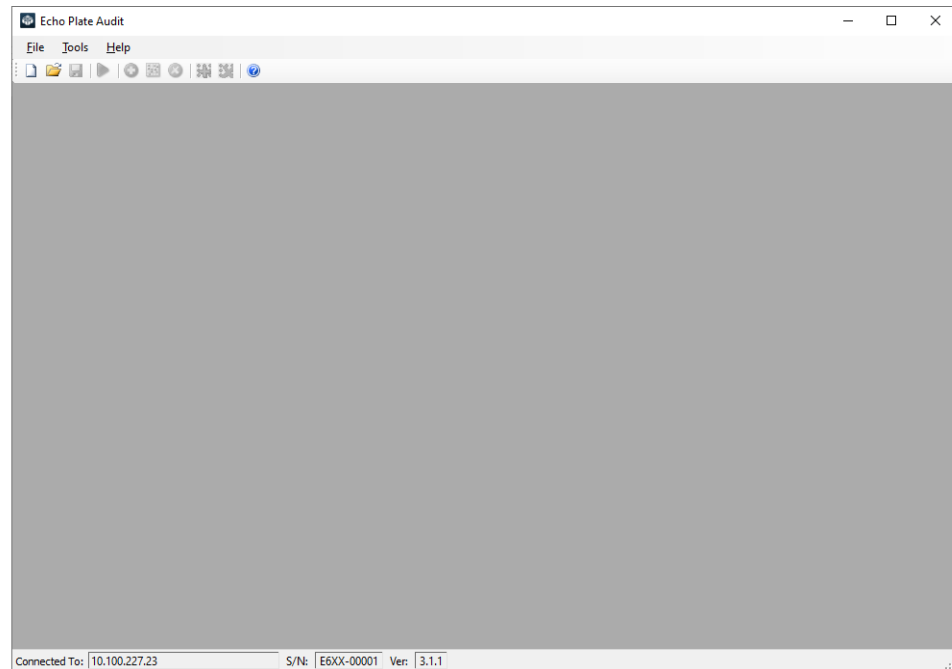
The **Connect to Instrument** dialog box connects the Echo Plate Audit application to a specific Echo instrument, if there are multiple instruments. If there are no instruments listed for **Instrument**, it means that the application has never connected to an instrument. After the first time a user connects to the instrument from the application, that Echo instrument will be added to the dropdown list in the application.

NOTE Activating an instrument allows the user to run an actual protocol on a licensed Echo instrument. The user can still connect to the Echo instrument and create a protocol even if the licensing requirements have not been completed, but must click the **Work Offline** button to work offline. The protocol can be created but cannot be run until the licensing requirements have been met. If the user recently installed or upgraded the software, the instrument will need to be activated. See [Activating the Instrument](#) for more information.

4 Choose one of the following start options:

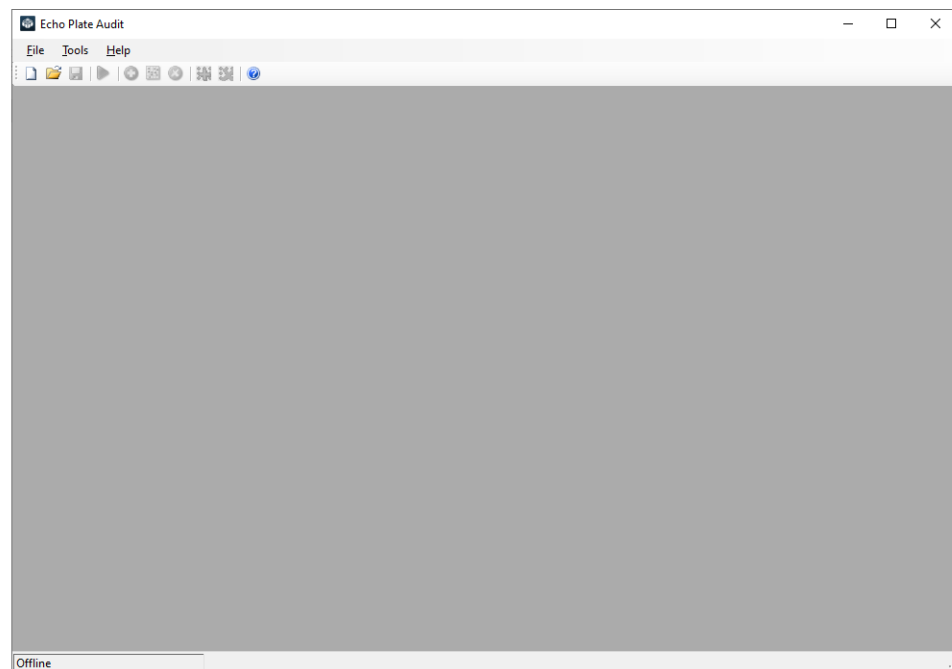
- **Connect:** Select an Echo Liquid Handler from the **Instrument** menu and click **Connect**. The Main Window opens with the connection status and instrument information at the bottom of the screen. This option enables the user to execute the sample or reagent survey as soon as the survey protocol is ready.

Figure 3.3 Echo Plate Audit application connected to an Echo Liquid Handler



- **Work Offline:** Click **Work Offline**. The Echo Plate Audit application opens with the connection status set to offline at the bottom of the screen. This option enables the user to create a survey protocol and run a simulation without connecting to the Echo Liquid Handler.

Figure 3.4 Echo Plate Audit application offline



Activating the Instrument

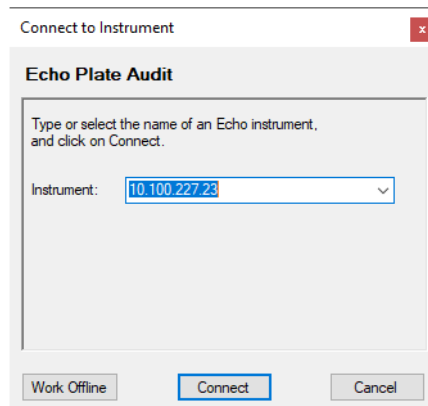
To run a protocol created from the Echo Plate Audit application on an Echo Liquid Handler, the user must activate this application for each Echo Liquid Handler. Each application has to be activated for the instrument connected.

- The Echo Plate Audit application must be activated with the software license key provided by Beckman Coulter.
- If the Echo Plate Audit application was installed with the Echo Liquid Handler by a Beckman support engineer, the activation step should not be necessary.

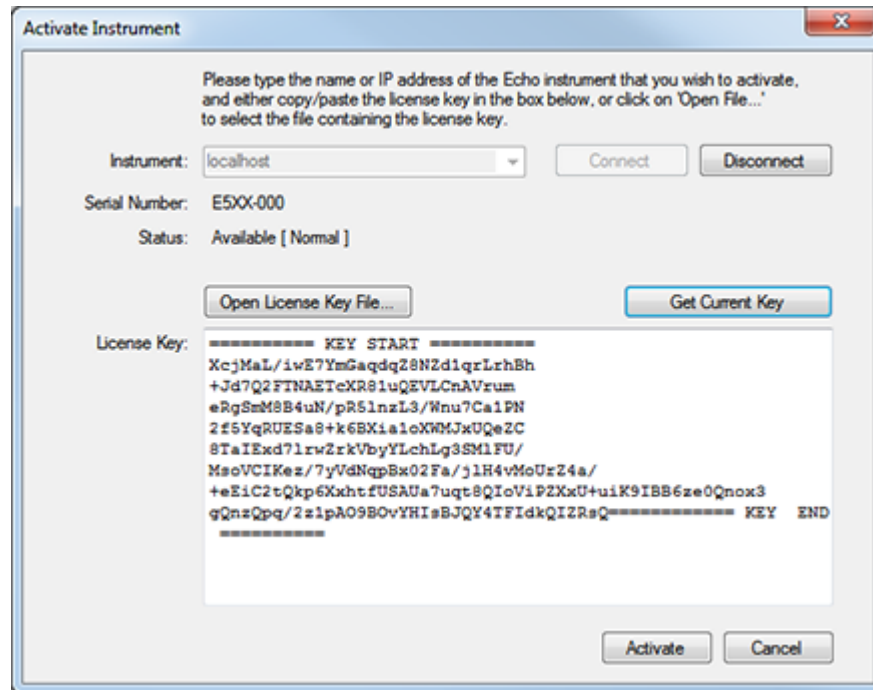
To activate the instrument

- 1 Start the Echo Plate Audit application. See [Starting the Software](#) for more information.
- 2 In the **Connect to Instrument** dialog box, type the name or IP address of the Echo server to connect to and click **Connect**.

Figure 3.5 Connect to instrument dialog box



- 3 Click the **Tools** tab in the **Toolbar** and select the **Activate Instrument** option.
- 4 Enter the license key. The license key is an encrypted block of text that authorizes the user to run the Echo Plate Audit application with a specific Echo Liquid Handler.
The license key can be entered in either of the following ways:
 - Copy the license key from the file received from Beckman Coulter and paste it into the **License Key** text box.
 - Click the **Open License Key File** button and browse for the license key file.

Figure 3.6 Activate instrument screen

NOTE The **Get Current Key** function is a useful troubleshooting tool used to verify that the key is written correctly to the instrument. When the **Get Current Key** button is clicked, the application searches for the license key and inserts it into the **License Key** text box. In case of an error, send the encrypted key to Beckman Coulter to determine if the license key is corrupted or if it applies to a different instrument.

5 Click the **Activate** button.

The Echo Liquid Handler should be activated now. This procedure is not required again unless a different instrument is activated or the application needs to be upgraded.

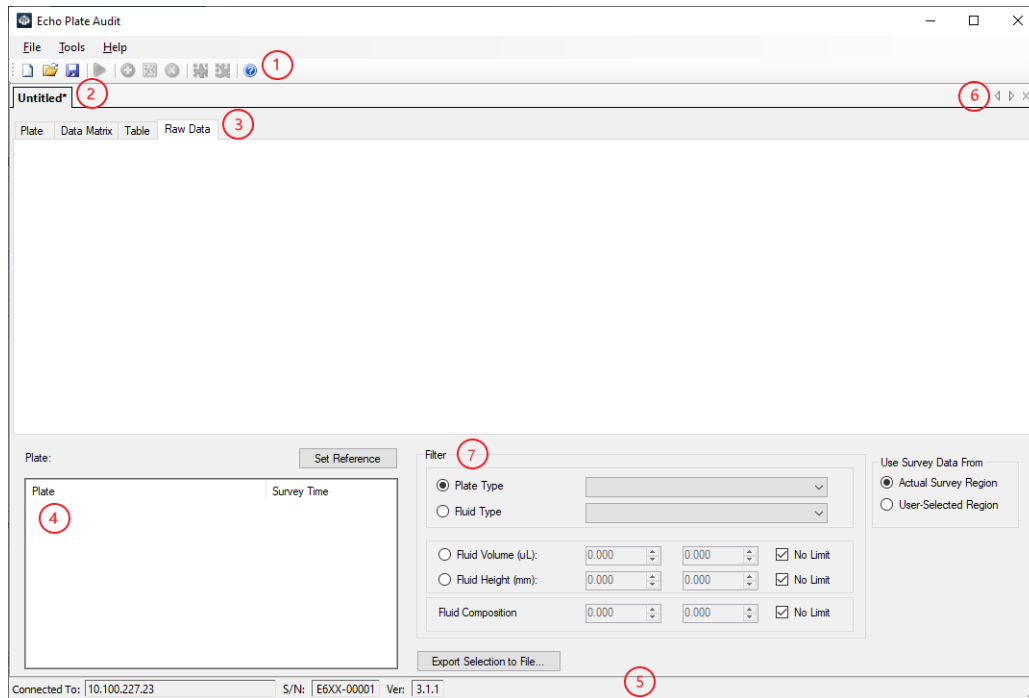
Understanding the Main Window

The **main Window** displays the **Protocol** window if a protocol is opened and the **Survey Data Set** window if a survey data set is opened. The sections below describe each of these windows and their screen components.

Survey Data Set Window

When a new or existing survey data set is opened, the **main Window** displays the **Survey Data Set** window.

Figure 3.7 Main Survey Data Set window



The table below describes the buttons/fields or sections in the **Main Survey Data Set Window** and their functionality.

Table 3.1 Callout table for Main Survey Data Set Window

Callout Number	Name	Description
1	Toolbar	The toolbar contains software menus that provide options to open and save survey protocols, set up the software, define Labware, run the protocol, customize protocol options, and display the online Help. The icons in the toolbar provide shortcuts to the most frequently selected options, such as the Run Protocol function. For a detailed description, see Tools Menu
2	Survey Data Set file name	The survey data set file name identifies the survey data set in the computer's directory. The application uses an .epadata file extension and stores the file in the default directory: C:\Labcyte\Echo\Protocols. The default directory can be changed to a user specified directory.
3	Window tabs	The window tabs open the following software windows: • Plate window — The main Survey Data Set window is the first window that is displayed when a new or existing survey data set is opened. It displays the wells that were surveyed. For a detailed description, see Protocol Tab. • Data Matrix window — Displays fluid volume for each well that was surveyed. For a detailed description, see Protocol Options Tab. • Table window — Displays a table with all the data generated that can be used as a survey report. • Raw Data window — Displays the survey data in XML.
4	Plate List	List of plates surveyed in the protocol.

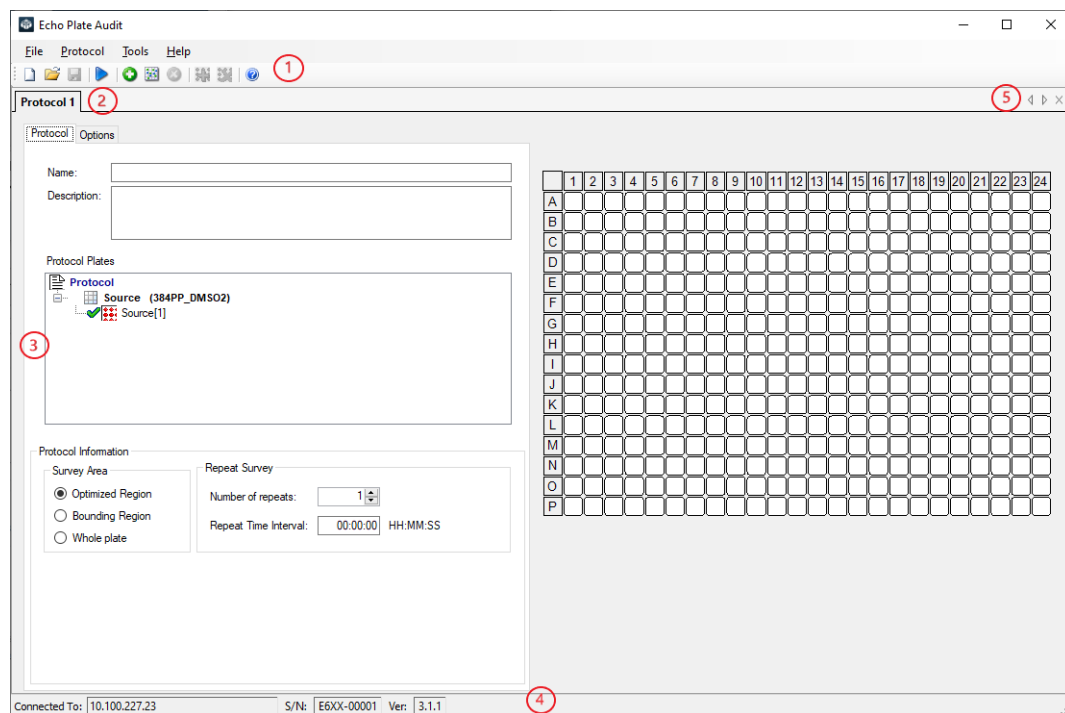
Table 3.1 Callout table for Main Survey Data Set Window

Callout Number	Name	Description
5	Status bar	The status bar displays Echo connection information, such as instrument name, serial number, and the version of the Echo client software that is running.
6	Navigation and Exit buttons	The left and right arrows become active when there are too many protocols open to view all of the file names. The arrows shift the protocol tabs left or right to display the file names. The Exit icon closes the displayed protocol.
7	Filter Information box	Allows the user to filter the survey data by plate type, fluid type, volume, height, and fluid composition. The filtered data can also be exported to a .csv file to be viewed later.

Protocol Window

When a new or existing protocol is opened, the **main Window** displays the **Protocol** window.

Figure 3.8 Main Window



The table below describes the buttons/fields or sections in the **Main Window** and their functionality.

Table 3.2 Callout table for Main Window

Callout Number	Name	Description
1	Toolbar	The toolbar contains software menus that provide options to open and save survey protocols, set up the software, define Labware, run the protocol, customize protocol options, and display the online Help. The icons in the toolbar provide shortcuts to the most frequently selected options, such as the Run Protocol function. For a detailed description, see Toolbar .
2	Protocol window	The protocol window is labeled with the protocol file name. The software uses an .epa file extension and stores the file in the default directory: C:\Labcyte\Echo\Protocols. The default directory can be changed to a user specified directory.
3	Protocol window tabs	The window tabs open the following software windows: • Main Protocol window — The main Protocol window is the first window that is displayed when a new or existing protocol is opened. It contains all of the default protocol data necessary to perform the survey. For a detailed description, see Protocol Tab. • Options window — The Options window displays protocol-specific options, such as survey history, output file type, and report formats. For a detailed description, see Protocol Options Tab.
4	Status bar	The status bar displays Echo connection information, such as instrument name, serial number, and the version of Echo client software that is running.
5	Navigation and Exit buttons	The left and right arrows become active when there are too many protocols open to view all of the file names. The arrows shift the protocol tabs left or right to display the file names. The Exit icon closes the displayed protocol.

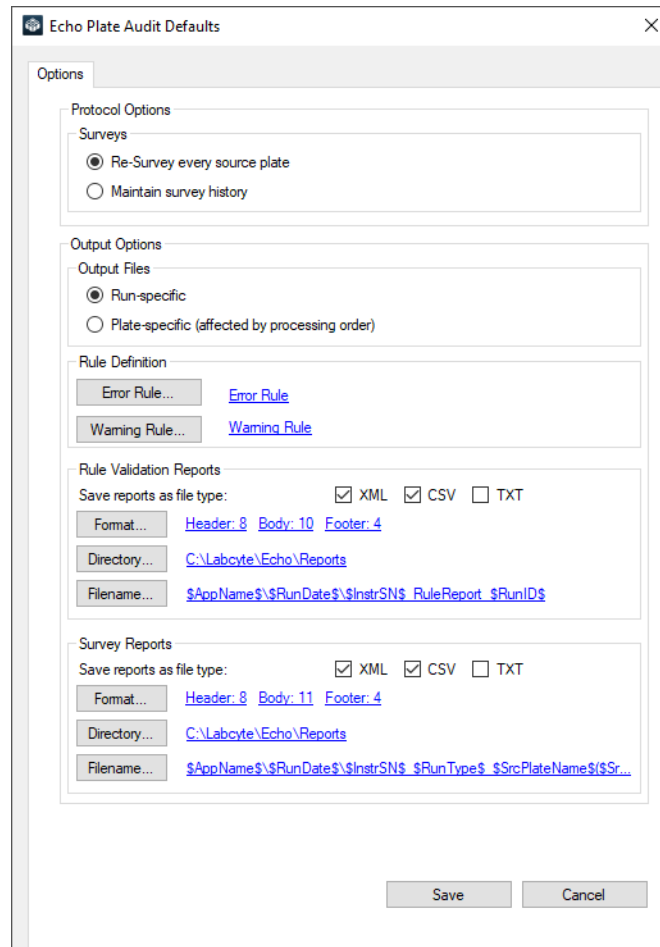
Setting Up the Software

The Echo Plate Audit application is simple to set up. Default settings, such as output file type and report format, can be modified here. The Echo Plate Audit application provides survey data in three file formats (csv, xml, and txt) with reporting options that can be customized to meet protocol-specific needs.

To change the default settings, and set up preferences:

- 1 Open the **Tools** menu and select **Preferences**.

Figure 3.9 Preferences/Options dialog box



- 2 Select **Run-specific** or **Plate-specific** for the output files.
 - **Run-specific** — Stores all of the survey results in a file.
 - **Plate-specific** — Stores all of the survey results in separate files.
- 3 Customize the survey and rule validation reports.
 - **File type** — Select XML, CSV, and/or TXT file formats.
 - **Format** — Customize the survey report header, body, and footer.
 - **Directory** — Change the directory location for the survey report.
 - **Filename** — Change the file name for the survey report.

4 Customize the error and warning rule definitions.

- **Error Rule** — Customize the error rule by adding conditions, setting the plate status criteria and choosing the scope. For more information, see [Rule Definitions](#).
- **Warning Rule** — Customize the warning rule by adding conditions, setting the plate status criteria and choosing the scope. For more information, see [Rule Definitions](#).

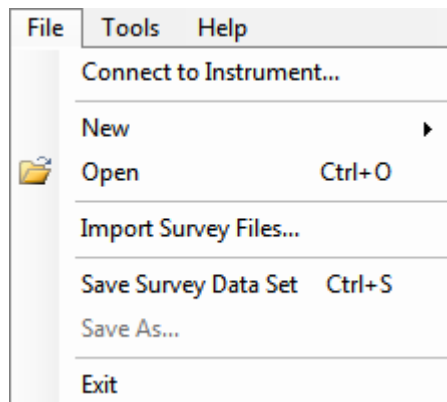
These options are used as default settings for all survey protocols. To change the options for an individual protocol, use the **Options** tab. For more information, see [Protocol Options Tab](#).

Shutting Down the Software

There are two ways to exit the Echo Plate Audit application:

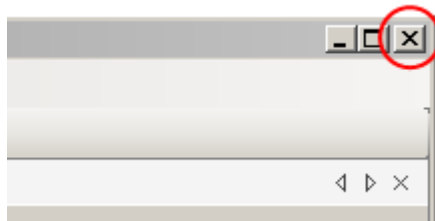
- Open the **File** menu and select **Exit**.

Figure 3.10 Exit function in the File menu



- Click the **Close** icon in the application.

Figure 3.11 Close window icon



CHAPTER 4

Software Operations

This chapter describes how to use the Echo Plate Audit application. It includes the following topics.

- Starting a New Protocol
- Selecting the Source Plate Type
- Selecting the Survey Area
- Importing a Pick List
- Importing a Pick List While Running a Protocol
- Editing the Protocol
- Running a Protocol
- Importing a Survey Data Set
- Viewing Reports
 - Analyzing Plate Data
 - Comparing Plates Within a Batch or Over Time
 - Comparing Fluid Hydration and Volume Across Replicates
 - Using a Filter to Compare Expected Versus Actual Values
 - Identifying Wells for Replenishment
- Creating a Custom Rule
 - Understanding Warning Rules and Error Rules
 - Reusing Rules
 - Running Reports Based on Rules
 - Running Example Scenarios

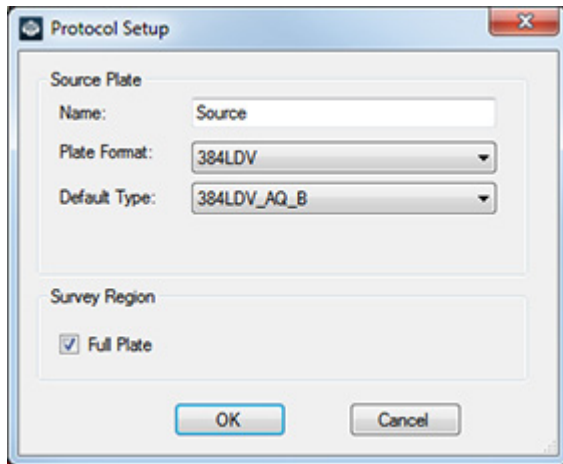
Starting a New Protocol

There are multiple ways to start a new protocol.

1. Select **New** from the **File** menu.
2. Click the **New**  icon in the **Toolbar**.
3. Press **CTRL+N** from the keyboard.

NOTE The new protocol is temporarily labeled Protocol 1 as the file name until the user saves the protocol with a new name.

Figure 4.1 Protocol Setup window



NOTE As information is entered into the template, an * appears next to the file name. This is a reminder that the file has information that has not been saved. Remember to save the protocol after designing the source plate and periodically saving thereafter.

- All new protocols start with the **Protocol Setup** window. This window defines the plate names, plate formats, plate types, and if the user wants a full plate survey.
- Plate type refers to the fluid type being used and the plate format determines the graphical layout that is shown in the protocol creation window.
- When surveying a full plate, select **Full Plate** under **Survey Region** in the **Protocol Setup** window. The software automatically configures the protocol to survey a full plate once the **Protocol Setup** window is closed.

Selecting the Source Plate Type

Choosing the plate format determines the physical plate parameters that the Echo Plate Audit application uses. Choosing the plate type determines the survey method that the Echo Liquid Handler uses; taking the plate and fluid properties into account. These settings enable the Echo system to survey multiple fluid types in the same source plate. For example, using the plate format 384PP and plate type MyBuffer_AQ_GP instructs the Liquid Handler to survey samples from a 384PP format plate with a survey method suited for the Glycerol fluid class.

These steps are critical when creating the application protocol.

- 1 In the **Protocol Setup** window, set the **Name** for the **Source Plate**. The default name is **Source**.
- 2 Select the **Plate Format** to be 384PP, 384LDV, or 1536LDV. Based on the plate format chosen, the compatible plate types appear for **Default Type**.
- 3 Select the **Default Plate Type** to set the fluid type for the **Source Plate**.

-
- 4 In the **Survey Region** information box, select **Full Plate** to set the protocol to survey the entire source plate. Other survey regions can be created after closing the **Protocol Setup** window.
 - 5 Click **OK** to save changes and create the specified protocol or **Cancel** to discard changes.
 - 6 To add an additional source plate, see [Add Plate](#).
-

NOTE Not all plate formats and plate types are available on all instruments. The specific plate requirements per user environment are specified in the purchase agreement and programmed into the instrument prior to shipping.

Selecting the Survey Area

A region must be selected and added before it can be surveyed. There are different ways to select wells:

- Click top-left corner to select all the wells in the plate.
- Click on a number(s) (1-24) to select all the wells in that column(s).
- Click on a letter(s) (A-P) to select all the wells in that row(s).
- Click and drag to select specific wells.

NOTE If full plate replication was selected in the **Protocol Setup** window, a region containing all the wells in the plate was automatically created.

The **Add Region** command allows the user to add a region to a source plate so that it can be surveyed. Multiple survey regions can be added to a single protocol, each with a unique plate type selection. For more information, see [Add Region](#).

Importing a Pick List

As an alternative to graphically creating the source well mappings, the Echo Plate Audit application allows users to import a file to explicitly map source wells to be surveyed. After importing the file, these surveys are graphically represented in a new Echo Plate Audit protocol.

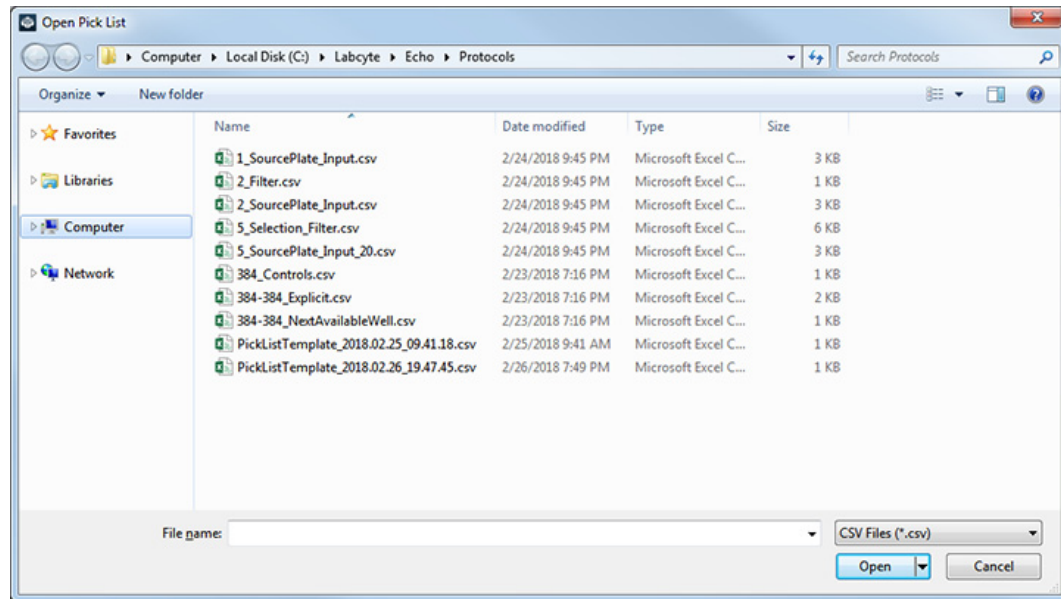
When a pick list is imported via the **Import Pick List** menu option, it can be modified or used as is. The user has the option to save the pick list changes back to the original file or as a new file.

To import a pick list:

- 1 Create a new protocol or open an existing protocol.

- 2 Select **Import Pick List** from the **File** menu.

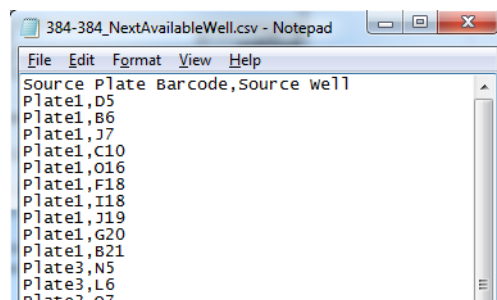
Figure 4.2 Open Pick List dialog box



- 3 Choose a .csv file that contains pick list data.
- 4 When the **Open Pick List** dialog box is shown, click **Open**. See [Importing a Pick List While Running a Protocol](#) for more information on importing a pick list.

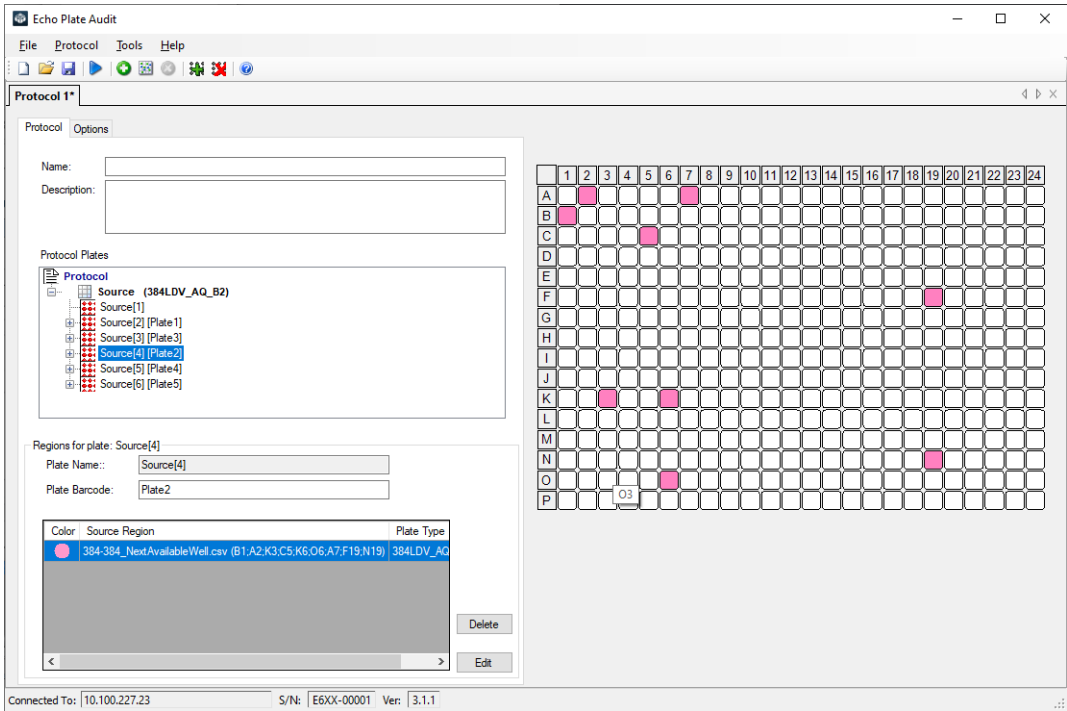
NOTE For this example, a full plate survey protocol was created before importing a 384-384_NextAvailableWell.csv file.

Figure 4.3 Contents of 384-384_NextAvailableWell.csv File



After the pick list file is imported, the full plate survey protocol is merged with the 384-384_NextAvailableWell.csv. The new protocol is shown below.

Figure 4.4 Full Plate Replication Protocol with 384-384_NextAvailable.csv



NOTE The 384-384_NextAvailableWell.csv file contents matches the regional information imported. This includes the transfer volume values.

NOTE The **Transfer Volume** is an optional field that specifies the total volume that is transferred out of the well in subsequent transfer protocols. The Echo Plate Audit application will survey the plate and verify that there is sufficient volume in the well, taking into account the dead-volume of the plate, to ensure that the transfer protocols are successful.

If the transfer volume plus the dead volume is less than the survey volume, those wells will be flagged to the user in the output reports.

Importing a Pick List While Running a Protocol

Importing a pick list from the Run Options dialog box is a quick way to run existing Echo Plate Audit protocols with partial source plates as defined by an input file. Using a pick list eliminates the need to create a unique protocol.

When importing a pick list via the Run Options dialog box, the pick list parameters override any plate parameters in the protocol for the run.

NOTE The pick list cannot be saved in the protocol. To save a pick list into an existing protocol, the Import Pick List feature must be used from the main Protocol window. See [Importing a Pick List](#) for more information.

The pick list is a table of specific wells that have been selected from a group of wells for analysis. The pick list is typically created in a text or spreadsheet file.

Guidelines for defining pick list:

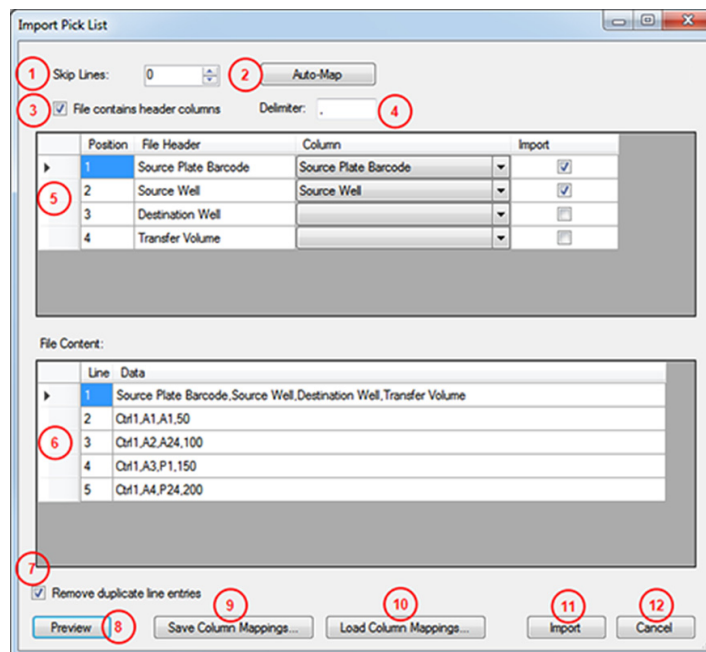
- Pick lists using row and column location must use the one-based coordinate system, which means that the first well in the upper left corner of the microplate is labeled row 1, column 1, or (1,1).
- Pick list must be saved in .csv file format to be used by the Echo Plate Audit application.

NOTE If an error is encountered when importing a pick list, the error message will show the column data that is needed.

To import a pick list:

- 1 Open the **File** menu and select **Import Pick List** or click on the **Import Pick List** icon in the **Toolbar**. This opens an **Open Pick List** dialog box.
- 2 Select the pick list file to be imported and click **Open**. This opens the **Import Pick List** dialog box.
- 3 Click **Import** to import the pick list.

Figure 4.5 Import Pick List dialog box



The table below describes the buttons/fields or sections in the **Import Pick List** dialog box and their functionality.

Table 4.1 Callout table for Import Pick List dialog box

Callout Number	Name	Description
1	Skip Lines	The pick list can contain heading information (for example, assay information, date, etc.), but it should be skipped when importing. Select a numerical value for Skip Lines to skip the number of specified heading lines for the column headings (header line).
2	Auto-Map button	Maps the column headings and data automatically.
3	File contains header columns	If the pick list contains a header line (column headings), select this option.
4	Delimiter	The delimiter used to separate data in the pick list file.
5	Column Details	• Position — Specifies the position in the file. • File Header — Specifies the header for the column. • Column — Specifies the column name. This drop-down list defines the columns that can be added to the pick list. • Import — Specifies if the data for the associated column should be imported or not.
6	Preview Result or File Content table	The results for this table are toggled based on if the user clicks the Preview or the File content button.
7	Remove duplicate line entries checkbox	Check this to remove duplicate entries in the source file when creating the pick list.
8	Preview or File content button	Toggles between the preview result showing the IDs, corresponding source wells, and other data available and the file content result showing the line number and corresponding data.
9	Save Column Mapping to File button	Exports the column mappings to a text file.
10	Load Column Mapping from File button	Imports the column mappings to be viewed.
11	Import button	Imports the source wells, destination wells, and transfer volume into the current protocol. NOTE By clicking Import , the existing protocol data is overwritten and cannot be undone unless the protocol was previously saved.
12	Cancel button	Closes the Import Pick List dialog box without saving any changes.

Editing the Protocol

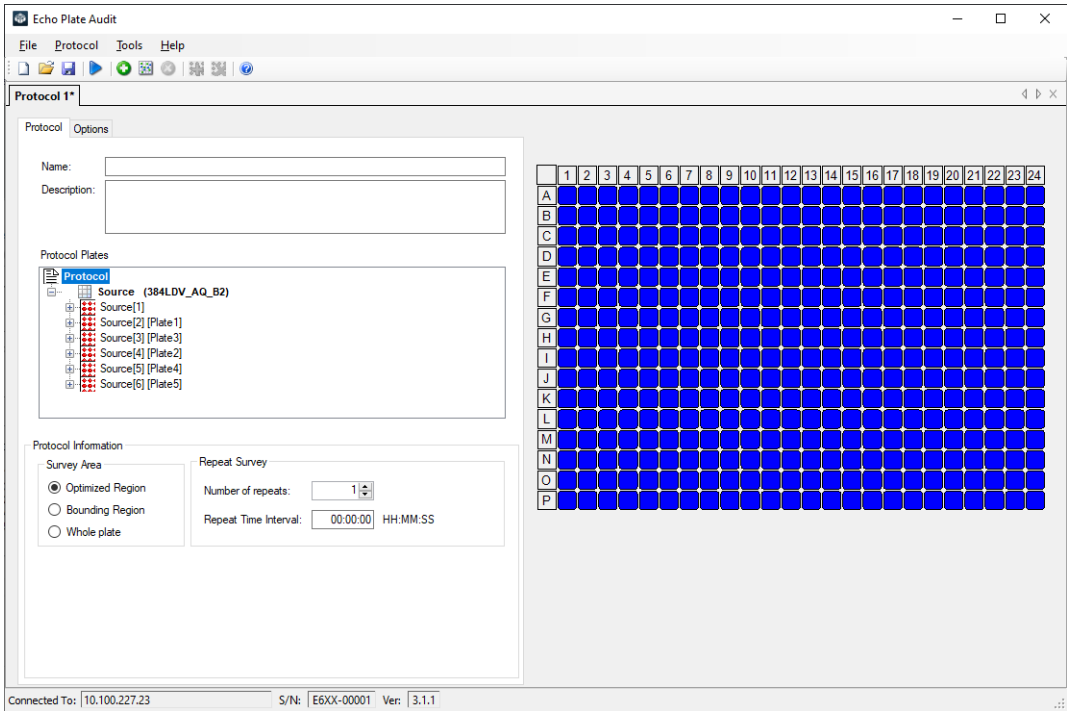
There are two ways to edit an existing protocol.

1. Select **Open** from the **File** menu and select the protocol to be edited.
2. Click the **Open**  icon in the **Toolbar** and select the protocol to be edited.

To edit the protocol:

- 1 Once the protocol to be edited has been loaded into the **main Protocol** window, the user can add or edit regions of the plate maps, add a fixed plate, or edit the settings entered initially when the protocol was first created in the **Protocol Setup** window.
- 2 Select **Protocol** in the **Protocol Plates** box to view and edit the protocol settings such as the survey area, and the number of times a survey should be repeated and the time interval between each survey.
- 3 Select the plate to edit or delete the entire plate or regions in the plate.
 - Select the plate type to change the plate type.
 - Select a specific region to edit the region.
 - Select the plate to view and edit all the regions in the plate.
 - Select the region and click **Delete** or **Edit**.
 - To delete a region, right-click the region in the protocol tree and select **Delete**.
- 4 Select items in the **Protocol Plates** box to view and change protocol settings, plate maps, and individual regions in the plate maps.
- 5 Use the color-coded tree for the wells in the **Protocol Plates** box to track and change the regions in the source plate maps.
- 6 Use the Protocol Information box to edit the settings for the items selected in the **Protocol Plates** box. Enter the protocol **Name** and **Description** in the **main Protocol** window.

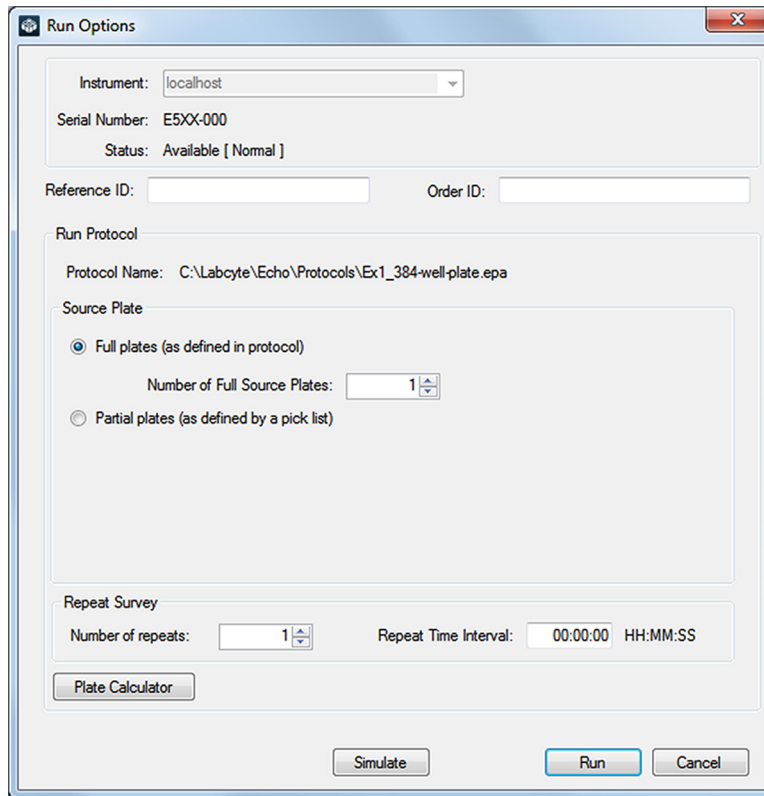
Figure 4.6 Main Protocol window



Running a Protocol

To begin a protocol simulation or live run:

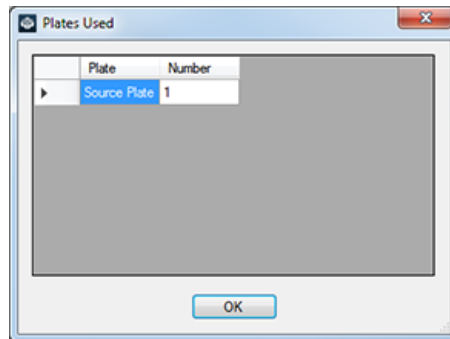
Figure 4.7 Run Options dialog box



- 1 Select **Run** from the **Protocol** menu or click the **Run**  icon in the **Toolbar**.
- 2 Select the **Instrument** if it is not already selected.
- 3 Optionally, enter a **Reference ID** and/or **Order ID** to be used to reference the run in the output report files.
- 4 Select the **Full Plates** or **Partial Plates** option:
 - Choose the **Full Plates** option to pick the full plate. The **Full Plates** option is defined by the protocol, but the user must specify the number of source plates to process.
 - Choose the **Partial Plates** option to pick specific plates. When the **Partial Plates** option is selected, an **Import** button is displayed to import a .csv pick list indicating the wells to be surveyed. For more information on how to define a pick list, see [Importing a Pick List While Running a Protocol](#).

- 5 Change the value for **Number of repeats** to override the number of repeat surveys set for the protocol. Changing the **Repeat Time Interval** value will override the original setting in the protocol for the time delay between repeated surveys.
- 6 Click the **Plate Calculator** button to view the number of plates needed to run the protocol.

Figure 4.8 Plates Used dialog box



- 7 Optionally, click **Simulate** to test the protocol.

NOTE Running a simulation is recommended to verify the transfers defined in the protocol before a live run.

- 8 Click **Run** to execute the protocol.

Importing a Survey Data Set

Importing a survey data set is useful to compare multiple survey reports.

To import a survey data set:

- 1 Start the Echo Plate Audit application. For more information, see [Starting the Software](#).
- 2 Select the **File > New > New Survey Data Set** menu option. An empty survey data set is created.
- 3 Select the **File > Import Survey Files** menu option. An **Open Survey Data** dialog box is opened.

- 4 Navigate to C:\Labcyte\Echo\Cache\Logs\Survey and choose an .xml file to import and click **Open**.
- 5 The plate is added in the **Plate** tab as a new plate. Additional iterations of the same plates that are added are listed as new **Iterations**.
- 6 Select the **File > Save > Survey Data Set** menu option. A **Save Data Sets** dialog box is shown.
- 7 Enter a filename and click **Save** to save and close the dialog box. This saves the survey data set with the various plates that were added and allows for re-use at a later time.

Figure 4.9 Imported survey data set

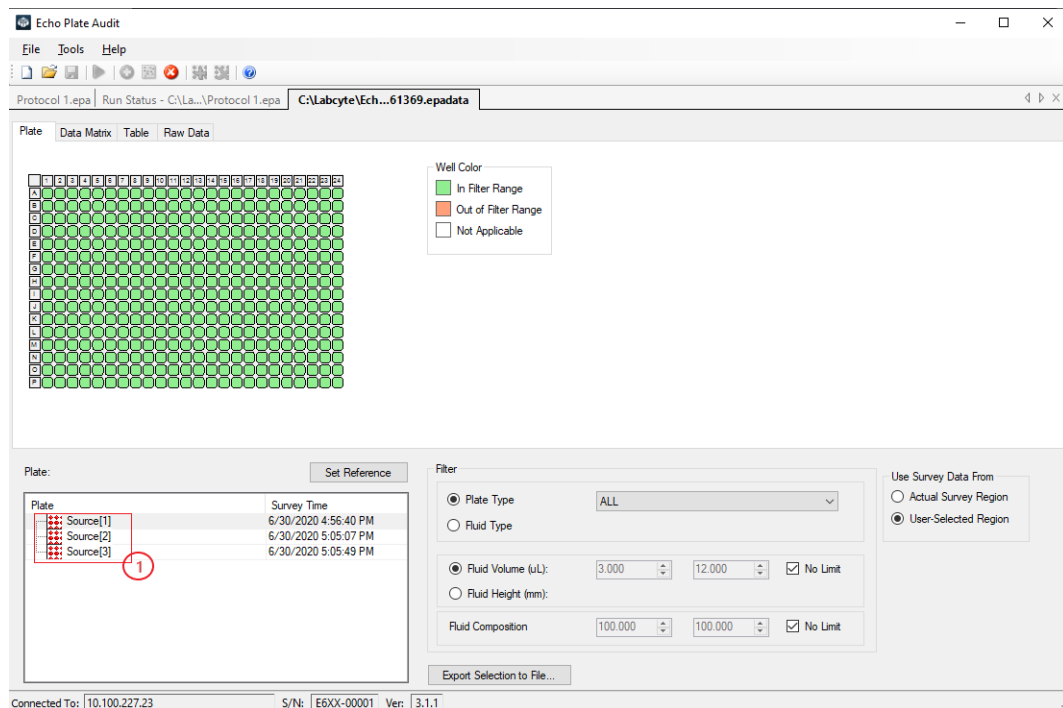


Table 4.2 Callout table for Plate tab

Callout Number	Name	Description
1	N/A	Three plates were added to this survey data set

Viewing Reports

A survey data set is generated after a successful protocol run is completed. The survey data set is comprised of various reports that can be used to analyze plate data. The results of these .csv files are graphically displayed in the following tabs when a survey data set (.epadata) file is opened.

- **Plate View** — Displays the wells that were surveyed.
- **Data Matrix View** — Displays fluid volume for each well that was surveyed.
- **Table View** — Displays a table with all the data generated that can be used as a survey report.
- **Raw Data View** — Displays the survey data in XML.

For more information about reporting, see the following topics:

- [Analyzing Plate Data](#)
- [Comparing Plates Within a Batch or Over Time](#)
- [Comparing Fluid Hydration and Volume Across Replicates](#)
- [Using a Filter to Compare Expected Versus Actual Values](#)
- [Identifying Wells for Replenishment](#)

Analyzing Plate Data

The survey area for the plate is defined in the **main Protocol** window.

Figure 4.10 Main Protocol window

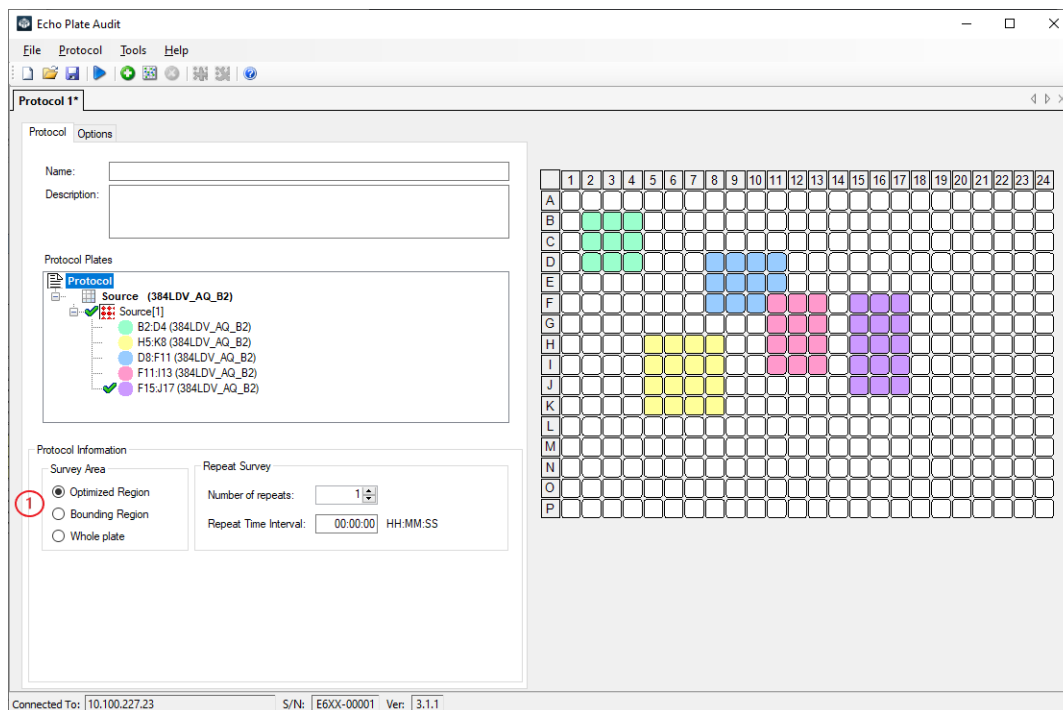


Table 4.3 Callout table for Plate tab

Callout Number	Name	Description
1	Survey Area	Used to define how and which regions of the plate should be surveyed.

The survey area selected determines if an optimized region, bounded region, or whole plate should be surveyed. The number of times the survey should be repeated and the interval of time between each survey is also set.

After the survey area is defined and the protocol is run, a corresponding survey data set is created for the protocol.

To view the survey data set plate data:

- 1 Start the Echo Plate Audit application. For more information, see [Starting the Software](#).
- 2 Select the **File > Open** menu option or click on the **Open** icon in the Toolbar.
- 3 Navigate to C:\Labcyte\Echo\Reports\Labcyte Echo Plate Audit.
- 4 Open the folder for the protocol survey data set that was created and select the .epadata file. The folders are organized by the date the protocol was run.
- 5 Double-click on the .epadata file to open it. The **Plate** tab is displayed.

Comparing Plates Within a Batch or Over Time

To compare plates within a batch, a user should run the same Echo Plate Audit protocol across multiple plates. Then the user can compare plate 1 to plate 2.

To compare within a batch:

- 1 Create or open a new protocol. For more information, see [Starting a New Protocol](#).
- 2 In the **main Protocol** window, select **Protocol** in the **Protocol Plates** tree. The **Protocol Information** section is displayed.
- 3 Save and run the protocol for the number of plates in the batch. For more information, see [Running a Protocol](#).

- 4 After the run is completed, the survey data is displayed in a new .epadata file.
- 5 Use the **Plate** tab to view a graphical representation of the plate data.
- 6 In the **Plate** section on the **Plate** tab, the plates surveyed can be sorted by **Plate** or **Iteration**.
- 7 Use the **Set Reference** button to set one of the plates in a batch as the reference plate. Now when any other plate in the batch is selected, the data displayed will represent the difference between the selected plate and the benchmark.

Figure 4.11 .Epadata Set Reference section

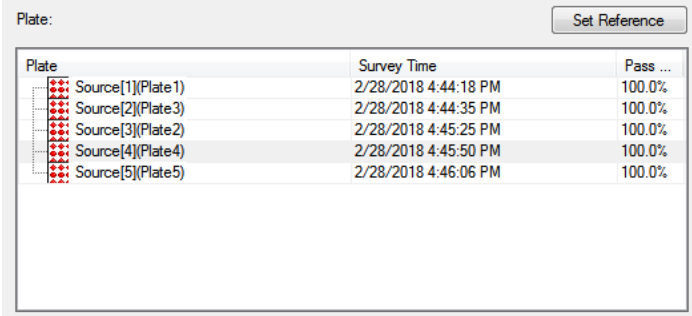


Plate	Survey Time	Pass ...
Source[1](Plate1)	2/28/2018 4:44:18 PM	100.0%
Source[2](Plate3)	2/28/2018 4:44:35 PM	100.0%
Source[3](Plate2)	2/28/2018 4:45:25 PM	100.0%
Source[4](Plate4)	2/28/2018 4:45:50 PM	100.0%
Source[5](Plate5)	2/28/2018 4:46:06 PM	100.0%

To compare plates over time, the user can repeat an Echo Plate Audit protocol multiple times for a single plate or a batch of plates at a specific interval (once every minute, hour, or day). Then the user can compare the data across the different time points for each plate (set instance one as a bench mark, and then when instance two or three is selected, the data displayed will represent the difference between that instance and the benchmark).

To compare plates over time:

- 1 Create or open a new protocol. For more information, see [Starting a New Protocol](#).
- 2 In the **main Protocol** window, select **Protocol** in the **Protocol Plates** tree. The **Protocol Information** section is displayed.
- 3 In the **Repeat Survey** section, enter the desired time interval for **Repeat Time Interval**. This value indicates the wait time between surveys for a given plate or batch of plates. For example, the time interval can be set to 00:00:60 to survey the plate(s) every minute, 00:60:00 to survey the plate(s) every hour, or 24:00:00 to survey the plate(s) every day.

- 4 Save and run the protocol. When running the protocol, set the number of source plates equal to the number of plates in a batch. For more information, see [Running a Protocol](#).
- 5 After the run is completed, the survey data is displayed in a new .epadata file.
- 6 Use the **Plate** tab to view a graphical representation of the plate data.
- 7 In the **Plate** section on the **Plate** tab, all plates from the batch are listed. Select any plate in the batch to view its specific survey data.
- 8 Use the **Set Reference** button to set one of the iterations of a plate as the reference. When any other iteration of the same plate is selected, the data displayed will show the difference between the selected iteration and the reference.

Figure 4.12 .Epadata Set Reference section

Plate	Survey Time	Pass ...
Source[1]		
Iteration 1	2/28/2018 4:40:19 PM	100.0%
Iteration 2	2/28/2018 4:40:29 PM	100.0%
Iteration 3	2/28/2018 4:40:39 PM	100.0%
Iteration 4	2/28/2018 4:40:48 PM	100.0%
Iteration 5	2/28/2018 4:40:58 PM	100.0%

Comparing Fluid Hydration and Volume Across Replicates

To study the changes in fluid composition or volume over time for samples in a microplate, a protocol can be created to repeatedly survey wells at a specified interval.

To compare fluid composition across replicates:

- 1 Create or open a new protocol. For more information, see [Starting a New Protocol](#).
- 2 In the **main Protocol** window, select **Protocol** in the **Protocol Plates** tree. The **Protocol Information** section is displayed.
- 3 In the **Repeat Survey** section, enter the desired value for **Number of repeats**. This value indicates the number of times the wells will be surveyed within a batch.

-
- 4 In the **Repeat Survey** section, enter the desired time interval for **Repeat Time Interval**. This value indicates the wait time between surveys for a given plate.

 - 5 Save and run the protocol. For more information, see [Running a Protocol](#).

 - 6 After the run is completed, the survey data is displayed in a new .epadata file.

 - 7 Use the **Plate** tab to view a graphical representation of the plate data.

 - 8 In the **Filter** section on the **Plate** tab, the plates surveyed can be sorted by **Plate Type** or **Fluid Type**. To filter the plate for fluid composition, select a specific **Fluid Type**. By selecting a specific type of fluid, the **Fluid Composition** values are displayed.

 - 9 Set the desired values for **Fluid Composition**. To manually set a range, the **No Limit** checkbox must be unchecked.
 - On the **Plate** tab, in the graphical plate representation, the colors for the wells change based on the ranges set for **Fluid Composition**.
 - On the **Data Matrix** tab, in the data values table, the colors for the wells change based on the ranges set for **Fluid Composition**. Since the values are shown in the table, it is easy to see how the actual values for fluid composition relate to the range specified.
-

To compare fluid volume across replicates:

- 1 Create or open a new protocol. For more information, see [Starting a New Protocol](#).

- 2 In the **main Protocol** window, select **Protocol** in the **Protocol Plates** tree. The **Protocol Information** section is displayed.

- 3 In the **Repeat Survey** section, enter the desired value for **Number of repeats**. This value indicates the number of times the wells will be surveyed within a batch.

- 4 In the **Repeat Survey** section, enter the desired time interval for **Repeat Time Interval**. This value indicates the wait time between surveys for a given plate.

- 5 Save and run the protocol. For more information, see [Running a Protocol](#).

-
- 6 After the run is completed, the survey data is displayed in a new `.epadata` file.

 - 7 Use the **Plate** tab to view a graphical representation of the plate data.

 - 8 In the **Filter** section on the **Plate** tab, the plates surveyed can be sorted by **Plate Type** or **Fluid Type**.

 - 9 Set the desired values for **Fluid Volume**. To manually set a range, the **No Limit** checkbox must be unchecked.
 - On the **Plate** tab, in the graphical plate representation, the colors for the wells change based on the ranges set for **Fluid Volume**.
 - On the **Data Matrix** tab, in the data values table, the colors for the wells change based on the ranges set for **Fluid Volume**. Since the values are shown in the table, it is easy to see how the actual values for fluid volume relate to the range specified.
-

NOTE To make a realistic comparison for hydration, the values set for **Number of repeats** and **Repeat Time Interval** on the **main Protocol** tab must be realistic for the fluids and plates used.

Using a Filter to Compare Expected Versus Actual Values

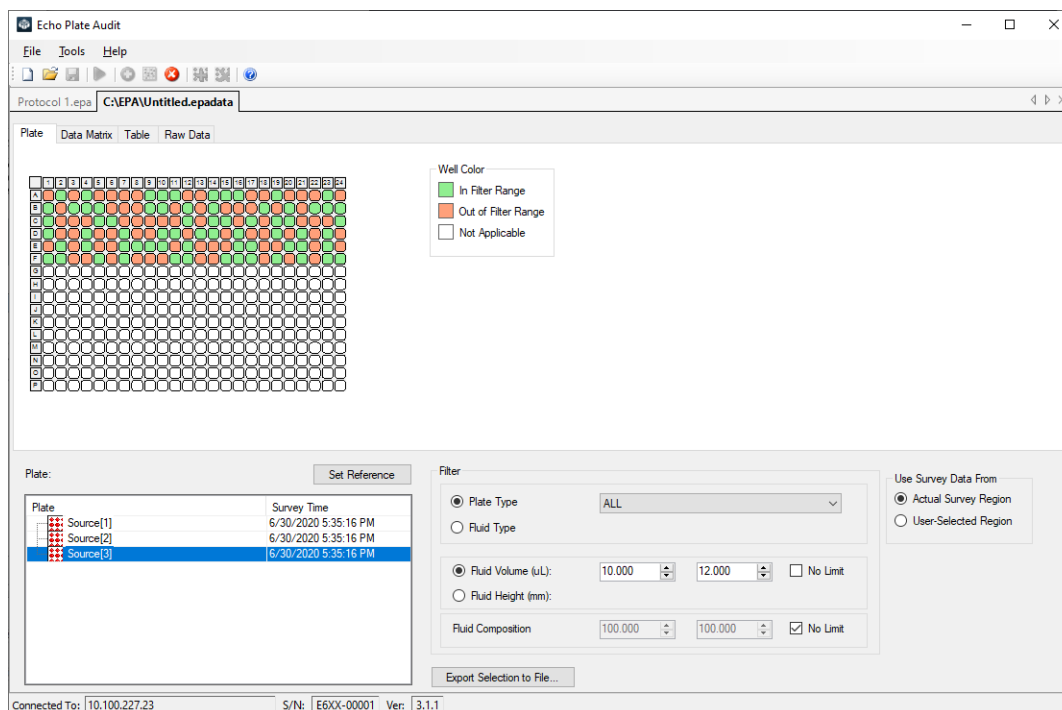
In an `.epadata` file, the **Plate** tab has a **User Survey Data From** section. This section allows the user to view the **Actual Survey Region** or the **User-Selected Region**. The **User-Selected Region** refers to the regions created by the user in the **main Protocol** tab.

The **Actual Survey Region** is specified when a protocol is first created. The defaults for the **Survey Area** are set to **Optimized Region**, the **Number of repeats** is set to **1**, and the **Repeat Time Interval** is set to **0**. The bounding region is a single rectangular survey region including all user selected regions and adjacent wells. The optimized region eliminates as many non-user selected wells as possible in an attempt to minimize the overall survey time.

In many cases the optimized region is greater than the actual region selected by the user. When the protocol is run, the optimized, bounded, or whole plate region is surveyed. When the `.epadata` file is displayed, the **User-Selected Region** is shown by default. If the user is interested in viewing the **Actual Survey Region**, the user should select **Actual Survey Region** in the **Use Survey Data From** information box.

NOTE The **User-Selected Region** filter is typically used since the user may not be interested in survey data for the additional wells surveyed by the bounded or optimized region.

Figure 4.13 Plate tab window



Identifying Wells for Replenishment

The user may want to identify wells for replenishment to ensure that the fluids required to complete a protocol run are sufficient. The minimum well volume limit should be set to identify any wells below the limit.

To identify wells for replenishment:

- 1 Create or open a new protocol. For more information, see [Starting a New Protocol](#).
- 2 In the **main Protocol** window, select **Protocol** in the **Protocol Plates** tree. The **Protocol Information** section is displayed.
- 3 Save and run the protocol. For more information, see [Running a Protocol](#).
- 4 After the run is completed, the survey data is displayed in a new **.epadata** file.
- 5 Use the **Data Matrix** tab to view the plate data in a table format.
- 6 In the **Filter** section on the **Data Matrix** tab, the plates surveyed can be sorted by **Plate Type** or **Fluid Type**.

-
- 7 Set the **Fluid Volume** range to identify the wells for replenishment. Typically this range would be zero to some minimum value that would be required to successfully complete the fluid transfer for the required plates. The user can also choose a valid range and use that to determine the wells that have sufficient fluid to complete the fluid transfers.

NOTE To manually set a range for **Fluid Volume**, the **No Limit** checkbox must be unchecked.

- On the **Plate** tab, in the graphical plate representation, the colors for the wells change based on the ranges set for **Fluid Volume**.
- On the **Data Matrix** tab, in the data values table, the colors for the wells change based on the ranges set for **Fluid Volume**. Since the values are shown in the table, its easy to see how the actual values for fluid volume relate to the range specified.

-
- 8 Click **Export Selection to File** to export selected wells to a .epadata file. The wells in the .epadata file can be used as a destination locations for transfers from stock solutions. Alternatively, the wells identified can be removed from any pick lists to prevent attempts to transfer from invalid wells.

-
- 9 Click **Save**.
-

Creating a Custom Rule

Custom rules are created to help the user identify warning and/or error conditions. There is one warning rule and one error rule defined per protocol. If the user does not choose to define custom rules, the default rules are applied to the protocol run to generate survey data.

Understanding Warning Rules and Error Rules

Warning and error rules are used to define specific conditions that the user wants to flag for a specific protocol. These rules are typically created to help identify if a plate is viable for a certain process or not.

For more information on how to define warning and error rules, see [Rule Definitions](#).

Reusing Rules

Rules can be exported and imported using a .rul file. The .rul file can be created by exporting a rule created in the **Custom Rule** dialog box. Likewise, a previously exported .rul file can be imported in the **Custom Rule** dialog box.

Exporting Rules from Files

To export a custom warning or error rule:

- 1 Open the **Options** tab or select **Tools > Preferences**.
- 2 Click the **Error Rule** or the **Warning Rule** button to open the **Custom Rule** dialog box.
- 3 Customize the error or warning rule by adding various conditions. For more information, see [Rule Definitions](#).
- 4 Click **Export** to export the customized rule shown in **Custom Rule** dialog box. A **Save Rule File** dialog box is shown where the user must specify the file name for the rule.
- 5 Click **Save** to save the rule and close the **Save Rule File** dialog box.

Importing Rules from Files

To import a custom warning or error rule:

- 1 Open the **Options** tab or select **Tools > Preferences**.
- 2 Click the **Error Rule** or the **Warning Rule** button to open the **Custom Rule** dialog box.
- 3 Click **Import** to import a previously customized rule into the **Custom Rule** dialog box. A **Open Rule File** dialog box is shown where the user can select a previously created .rul file.
- 4 Click **Open** to open the rule and close the **Open Rule File** dialog box. The rule is loaded into the **Custom Rule** dialog box.

Running Reports Based on Rules

Reports are generated every time a protocol is run. Use the Options tab to define the rules, rule validation reports, and survey reports. For more information, see [Protocol Options Tab](#).

Running Example Scenarios

The examples below are the most typical scenarios a user would use the Echo Plate Audit application for. The steps needed to successfully complete each of the protocols are listed for quick reference. In many cases, the steps have been described in previous sections and the user is referred back to those sections for details.

Verifying Sufficient Volume to Complete a Protocol

When a user must verify that there is sufficient volume in a well or plate before running a protocol with specific volume requirements, running an Echo Plate Audit protocol with specific volume related rules can be helpful. The survey protocol can be run to verify sufficient volume before an actual transfer protocol is run via other applications such as Echo Plate Reformat, Echo Cherry Pick, Echo Dose-Response, or Echo Array Maker.

To verify sufficient volume to complete a protocol:

- 1 Start a new protocol. For more information, see [Starting a New Protocol](#).
 - 2 Select the source plate type. All protocols start with this step. For more information, see [Selecting the Source Plate Type](#).
 - 3 Select the survey area. For more information, see [Selecting the Survey Area](#).
 - 4 Create custom rules. For more information, see [Rule Definitions](#).
-

In this example, a custom error rule was created with the following conditions:

- Error if Fluid Volume is less than 30.000 microLiters for greater than 25% of the plate.

Figure 4.14 Error Check dialog box

Custom Rule

Name: Error Rule

Condition

Variable	Relation	Value
Fluid Volume (uL)	<	30.000
None		
None		

Variables are

☒ AND
☐ OR

Conditions are

☐ AND
☒ OR

Add Condition

Import...

Export...

Plate Status Criteria

☒ Percentage of Wells
☐ Number of Wells

Relation: > Value: 25.000

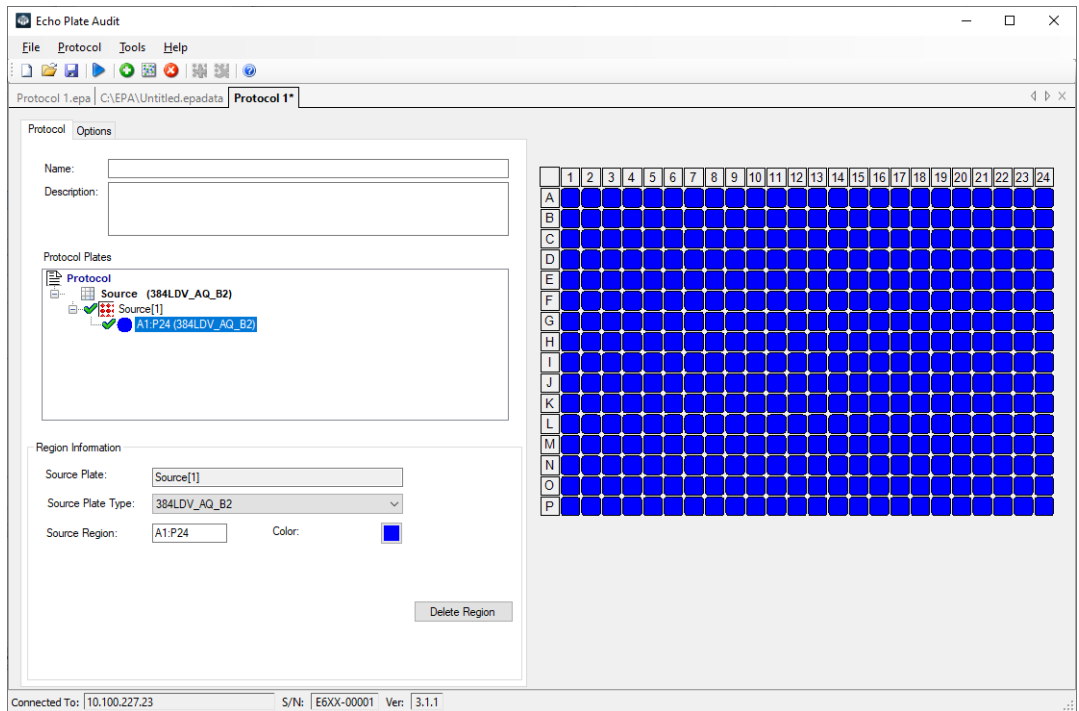
Scope

☐ Per Survey
☒ Per Plate

Delete Save Cancel

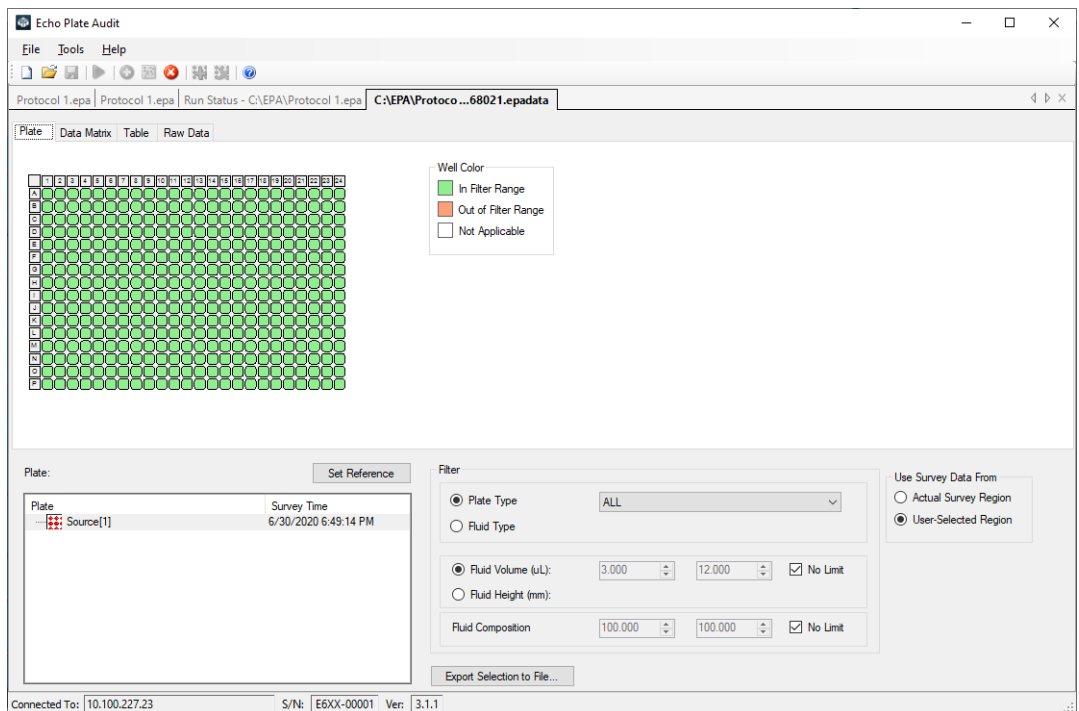
- 5 Run the protocol. For more information, see [Running a Protocol](#).
In this example, one source plate with full survey was created before the protocol was run.

Figure 4.15 Main Protocol window



- 6 View reports. After the protocol run is completed, the .epadata file is displayed with the resulting survey data.

Figure 4.16 Plate tab for corresponding .epadata file



- 7 To view the results of the error or warning rules, open the corresponding RuleReport.csv file.

NOTE In the .csv file, notice that all the columns with a Survey Fluid Volume < 30.000 have an Error in the corresponding Rule Well column. Since more than 25% of the wells had a Survey Fluid Volume < 30.000, the Rule Plate column also has an Error. This indicates to the user that this plate does not have sufficient fluid volume for transfer and should not be used.

Figure 4.17 RuleReport.csv file for protocol run

	A	B	C	D	E	F	G	H	I	J
	Source Plate Name	Source Plate Barcode	Source Plate Type	Source Well	Survey Fluid Volume	Fluid Composition	Fluid Units	Fluid Type	Rule Well Status	Rule Plate Status
11	Source[1]	Unknown	384PP_AQ_BP2	A1	27.276	11.171 Percent	Glycerol	Error	Error	
12	Source[1]	Unknown	384PP_AQ_BP2	A2	29.593	9.929 Percent	Glycerol	Error	Error	
13	Source[1]	Unknown	384PP_AQ_BP2	A3	28.431	10.403 Percent	Glycerol	Error	Error	
14	Source[1]	Unknown	384PP_AQ_BP2	A4	31.074	9.238 Percent	Glycerol	OK	Error	
15	Source[1]	Unknown	384PP_AQ_BP2	A5	28.2	9.716 Percent	Glycerol	Error	Error	
16	Source[1]	Unknown	384PP_AQ_BP2	A6	29.586	12.209 Percent	Glycerol	Error	Error	
17	Source[1]	Unknown	384PP_AQ_BP2	A7	28.86	11.998 Percent	Glycerol	Error	Error	
18	Source[1]	Unknown	384PP_AQ_BP2	A8	28.124	8.373 Percent	Glycerol	Error	Error	
19	Source[1]	Unknown	384PP_AQ_BP2	A9	29.658	9.574 Percent	Glycerol	Error	Error	
20	Source[1]	Unknown	384PP_AQ_BP2	A10	36.403	9.728 Percent	Glycerol	OK	Error	
21	Source[1]	Unknown	384PP_AQ_BP2	A11	29.625	11.211 Percent	Glycerol	Error	Error	
22	Source[1]	Unknown	384PP_AQ_BP2	A12	28.616	11.501 Percent	Glycerol	Error	Error	
23	Source[1]	Unknown	384PP_AQ_BP2	A13	27.539	11.404 Percent	Glycerol	Error	Error	
24	Source[1]	Unknown	384PP_AQ_BP2	A14	37.194	11.228 Percent	Glycerol	OK	Error	
25	Source[1]	Unknown	384PP_AQ_BP2	A15	37.64	10.376 Percent	Glycerol	OK	Error	
26	Source[1]	Unknown	384PP_AQ_BP2	A16	29.603	9.249 Percent	Glycerol	Error	Error	
27	Source[1]	Unknown	384PP_AQ_BP2	A17	28.224	8.676 Percent	Glycerol	Error	Error	
28	Source[1]	Unknown	384PP_AQ_BP2	A18	28.114	10.277 Percent	Glycerol	Error	Error	
29	Source[1]	Unknown	384PP_AQ_BP2	A19	38.145	13.254 Percent	Glycerol	OK	Error	
30	Source[1]	Unknown	384PP_AQ_BP2	A20	28.762	9.151 Percent	Glycerol	Error	Error	
31	Source[1]	Unknown	384PP_AQ_BP2	A21	28.109	8.438 Percent	Glycerol	Error	Error	
32	Source[1]	Unknown	384PP_AQ_BP2	A22	28.23	10.38 Percent	Glycerol	Error	Error	
33	Source[1]	Unknown	384PP_AQ_BP2	A23	31.16	10.423 Percent	Glycerol	OK	Error	
34	Source[1]	Unknown	384PP_AQ_BP2	A24	29.512	12.175 Percent	Glycerol	Error	Error	
35	Source[1]	Unknown	384PP_AQ_BP2	B1	29.84	10.259 Percent	Glycerol	Error	Error	
36	Source[1]	Unknown	384PP_AQ_BP2	B2	29.441	10.379 Percent	Glycerol	Error	Error	
37	Source[1]	Unknown	384PP_AQ_BP2	B3	32.799	11.041 Percent	Glycerol	OK	Error	
38	Source[1]	Unknown	384PP_AQ_BP2	B4	33.833	11.340 Percent	Glycerol	OK	Error	

- 8 Save the protocol and survey data set for future use.

CHAPTER 5

Software Reference

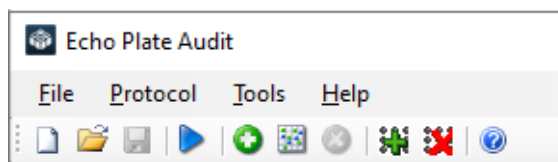
This chapter describes all of the Echo Plate Audit application screens. It includes the following topics.

- [Toolbar](#)
- [Protocol Tab](#)
- [Protocol Options Tab](#)
- [Preferences](#)
- [Labware Definitions](#)
- [Run Protocol](#)
- [Simulator Window](#)
- [Run Status Window](#)

Toolbar

The **Toolbar** contains the **File**, **Protocol**, **Tools**, and **Help** menus, and individual icons for frequently used functions.

Figure 5.1 Toolbar



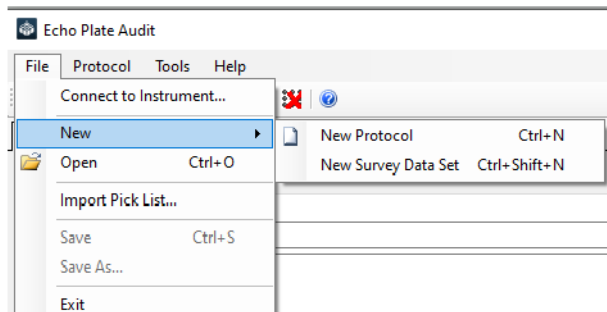
The topics below describe the functions that can be performed using the Toolbar.

- [File Menu](#)
- [Protocol Menu](#)
- [Tools Menu](#)
- [Help Menu](#)

File Menu

The **File** menu changes based on whether a **Protocol** or **Survey Data Set** is open in the main application window.

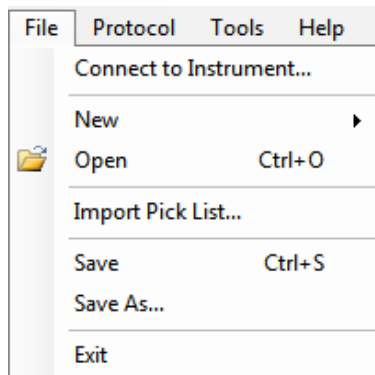
Figure 5.2 File menu without a protocol or survey data set open



- **Connect to instrument** — Selects an Echo instrument to connect to the software.
- **New** — Creates a new survey data set or survey protocol.
- **Open** — Opens an existing survey protocol or survey data set.
- **Exit** — Closes the Echo Plate Audit software.

File menu with a protocol selected in the main application window

Figure 5.3 File menu

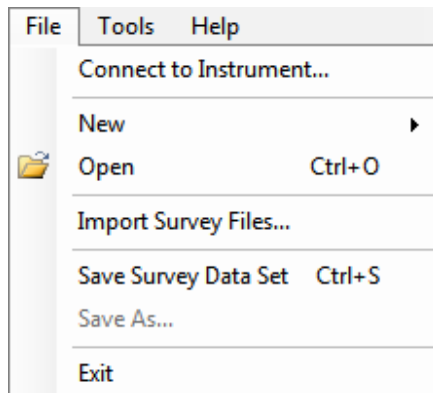


NOTE The default view in the main application window is the Protocol tab.

- **Connect to instrument** — Selects an Echo instrument to connect to the software.
- **New** — Creates a new survey protocol.
- **Open** — Opens an existing survey protocol.
- **Import Pick List** — Imports a predefined pick list. For more information, see [Importing a Pick List While Running a Protocol](#).
- **Save** — Saves the current survey protocol.
- **Save As** — Copies the current survey protocol to a different file name.
- **Exit** — Closes the Echo Plate Audit software.

File menu with a survey data set selected in the main application window

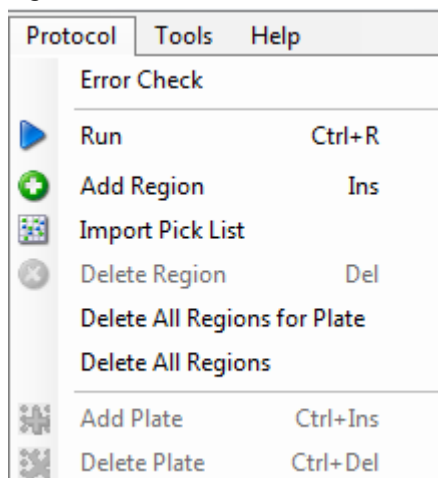
Figure 5.4 File menu



- **Connect to instrument** — Selects an Echo instrument to connect to the software.
- **New** — Creates a new survey data set.
- **Open** — Opens an existing survey data set.
- **Import Survey Data Set** — Imports a survey data set. For more information, see [Importing a Survey Data Set](#).
- **Save Survey Data Set** — Saves the current survey data set.
- **Save As** — Copies the current survey data set to a different file name.
- **Exit** — Closes the Echo Plate Audit software.

Protocol Menu

Figure 5.5 Protocol menu



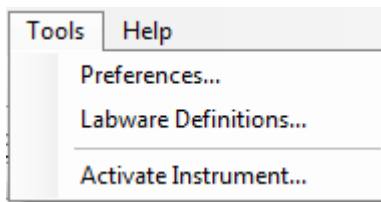
NOTE The **Protocol** menu is only available if a **Protocol** is open in the main application window.

- **Error Check** — Checks the protocol for inconsistent information.
- **Run** — Executes the survey protocol that is displayed.

- **Add Region** — Adds the selected region.
- **Import Pick List** — Imports a predefined pick list.
- **Delete Region** — Deletes the selected region.
- **Delete All Regions for Plate** — Deletes all the regions for the selected plate.
- **Delete All Regions** — Deletes all the selected regions.
- **Add Plate** — Adds a new plate to the protocol.
- **Delete Plate** — Deletes a plate from the protocol.

Tools Menu

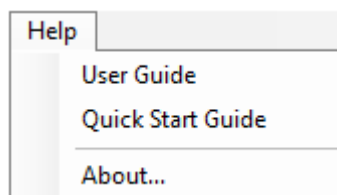
Figure 5.6 Tools Menu



- **Preferences** — Used to set survey, output, and report options for all protocols.
- **Labware Definitions** — Manages existing labware definitions or adds new definitions.
- **Activate Instrument** — Used to enter the software license key to use the Echo Plate Audit software.

Help Menu

Figure 5.7 Help Menu



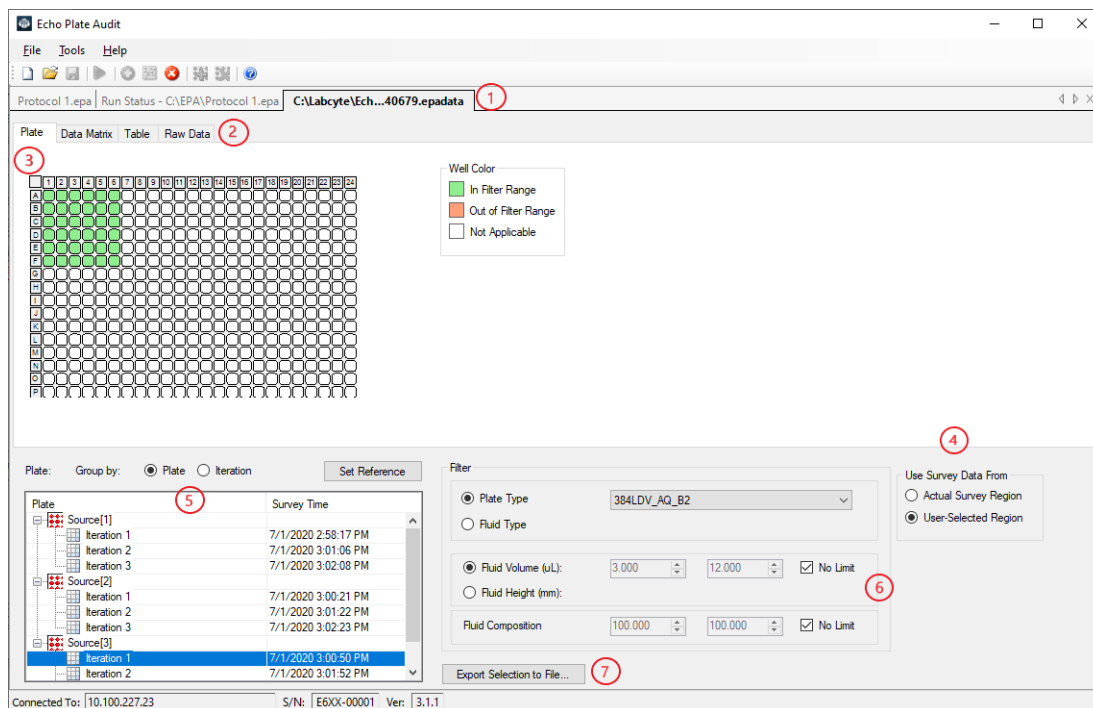
- **User Guide** — Launches the application User Guide in PDF format.
- **Quick Start Guide** — Launches the application Quick Start Guide in PDF format.
- **About...** — Display the version number of the Echo Plate Audit software.

Survey Data Set Tab

Plate Tab

The **Survey Data Set** tab displays the following information:

Figure 5.8 Survey Data Set tab with Plate tab selected



The table below describes the buttons/fields or sections in the **Survey Data Set** tab and their functionality.

Table 5.1 Callout table for Survey Data Set tab

Callout Number	Name	Description
1	Main Protocol tab	File name of the survey data set.
2	Survey Data windows	Plate, Data Matrix, Table, and Raw Data tabs. Details of the Plate tabs are described below. For more information on the Data Matrix tab, see Data Matrix Tab . For more information on the Table tab, see Table Tab . For more information on the Raw Data tab, see Raw Data Tab .
3	Source Plate	Graphical representation of the source plate.
4	Use Survey Data From	Used to determine if actual survey data or user-selected survey data should be displayed.
5	Plate	Lists the plates that were surveyed.

Table 5.1 Callout table for Survey Data Set tab

Callout Number	Name	Description
6	Filter	• Plate Type — List of available plate types. • Fluid Type — List of available fluid types. • Volume — Volume of fluid expressed in nanoliters (nL). If the volume is specified in the pick list, it will override the data specified in the protocol. • Height — Height of well in millimeters (mm). • Fluid Composition — Percentage of fluid type to water.
7	Export Selection to File	Exports the survey data to a .csv file for future use.

Data Matrix Tab

The **Data Matrix** tab displays the values for the survey data. The bottom half of the tab is the same as the **Plate** tab and allows the user to filter the survey data by plate type, fluid type, fluid volume, fluid height, and fluid composition.

Figure 5.9 Survey Data Set tab with Data Matrix tab selected

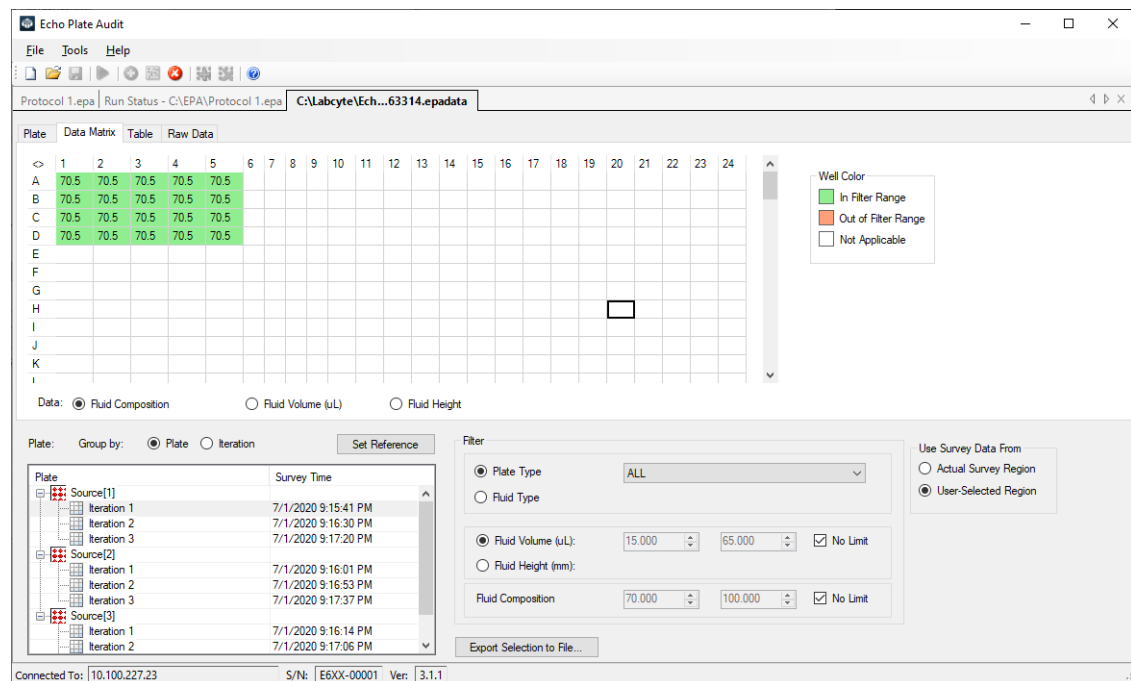
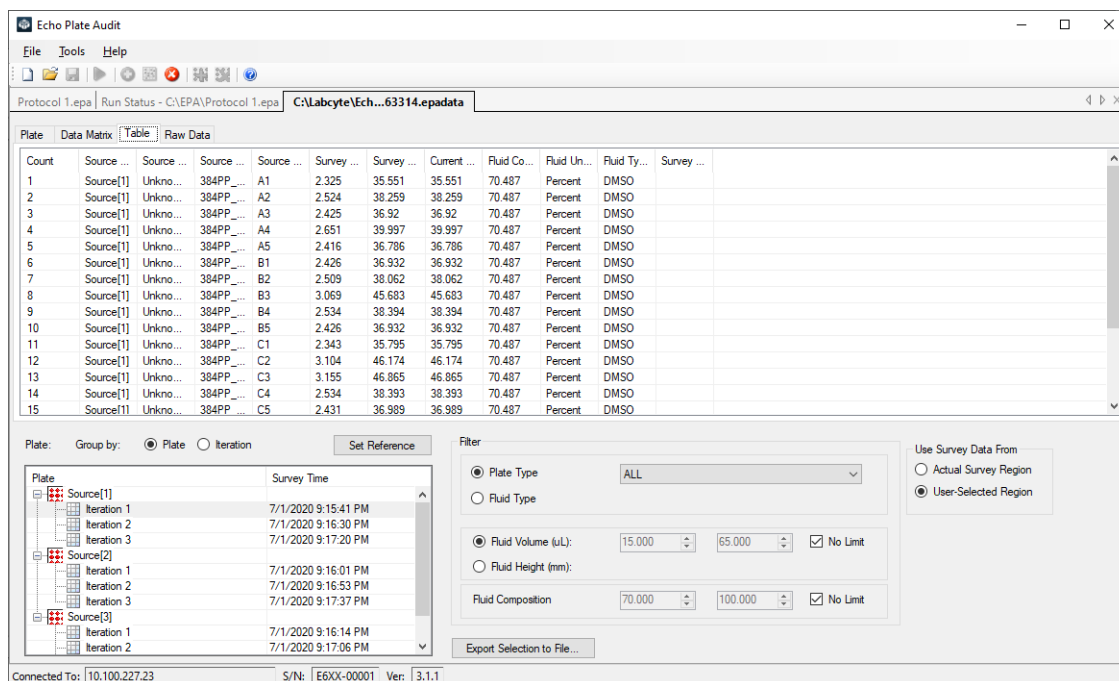


Table Tab

The **Table** tab displays all the survey data in columns. The bottom half of the tab is the same as the **Plate** tab and allows the user to filter the survey data by plate type, fluid type, fluid volume, fluid height, and fluid composition.

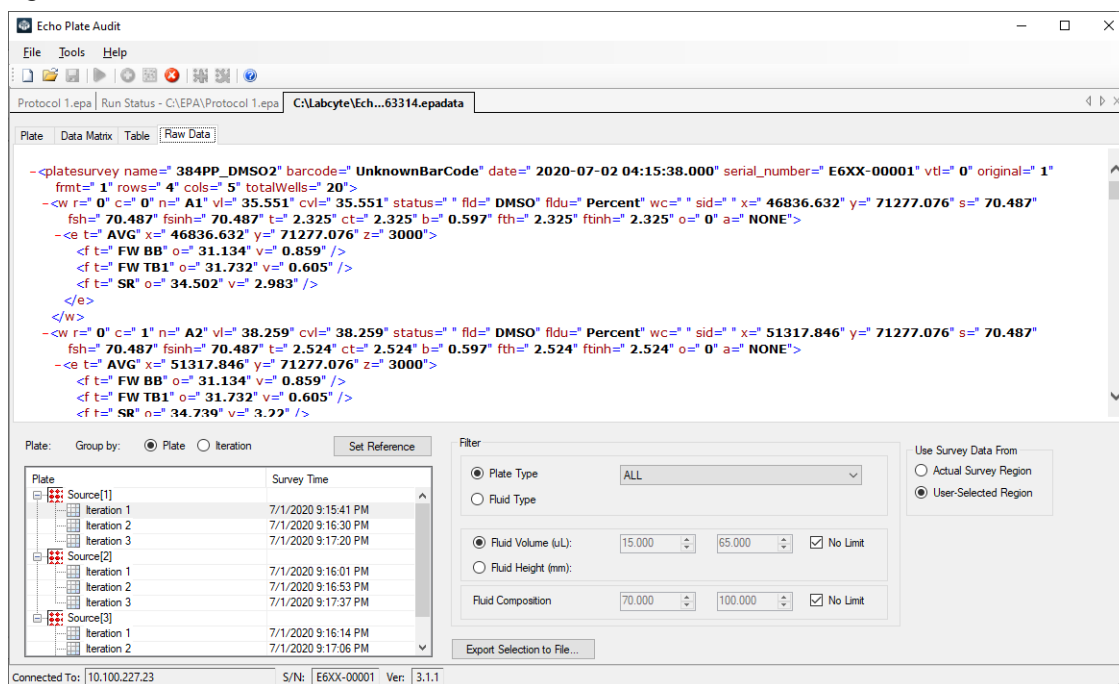
Figure 5.10 Survey Data Set tab with Table tab selected



Raw Data Tab

The **Raw Data** tab displays all the survey data in XML. The bottom half of the tab is the same as the **Plate** tab and allows the user to filter the survey data by plate type, fluid type, fluid volume, fluid height, and fluid composition.

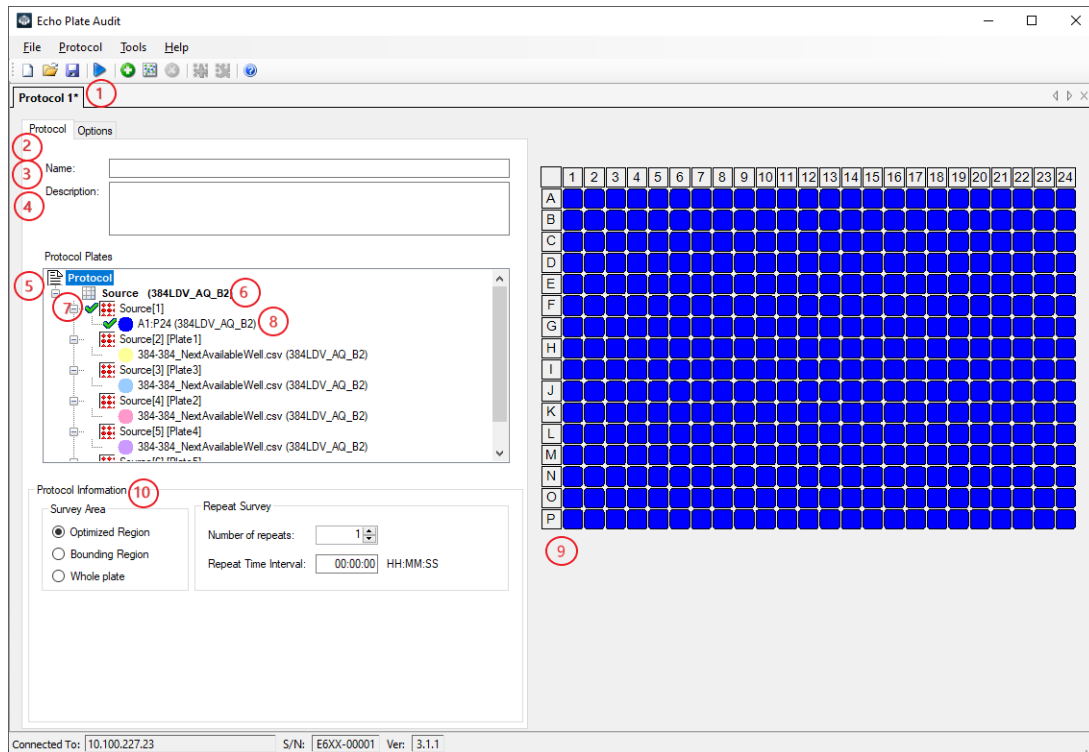
Figure 5.11 Survey Data Set tab with Raw Data tab selected



Protocol Tab

The **Protocol** tab displays the following information:

Figure 5.12 Protocol tab with Protocol selected



The table below describes the buttons/fields or sections in the **Protocol** tab and their functionality.

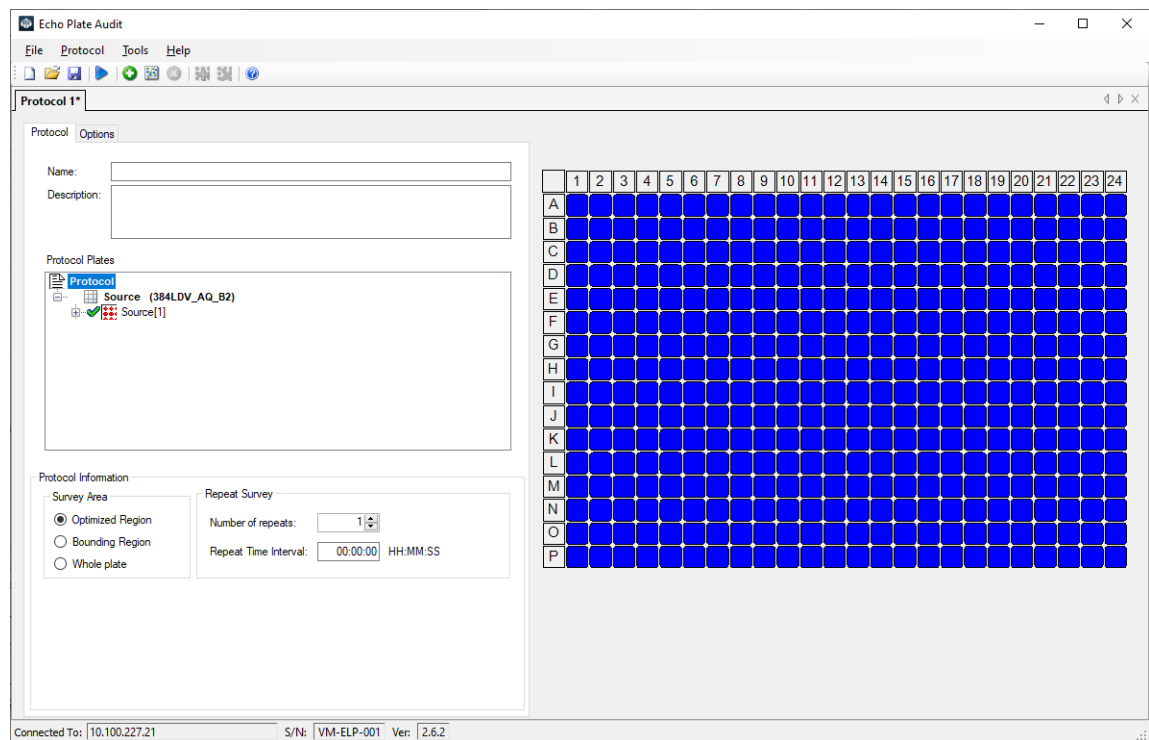
Table 5.2 Callout table for Protocol tab

Callout Number	Name	Description
1	Main Protocol tab	File name of the survey data set.
2	Protocol windows	Protocol and Options windows. Details of the Protocol window are described below. For more information on the, see Understanding Protocol Options .
3	Name	Defines the name of the protocol.
4	Description	Defines the name of the protocol.
5	Protocol	Selecting the protocol in protocol tree is used to set protocol specific features.
6	Source Plate Type	Defines the source plate type used in the protocol.
7	Source Plate(s)	Defines the source plate(s) used in the protocol.
8	Region(s)	Defines the region(s) in a source plate.

Table 5.2 Callout table for Protocol tab

Callout Number	Name	Description
9	Source Plate	Graphical representation for the selected source plate. Used to select a region before adding the region.
10	Selected source plate, source plate type, and source region information	The bottom left information box in the Protocol tab has fields that change depending on what is selected in the Protocol Plates tree. The examples below illustrate the different fields that appear depending on what is selected in the Protocol Plates tree.

In the **Protocol Plates** tree of the **Protocol** tab, if **Protocol** is selected, the following settings become available:

Figure 5.13 Protocol selected

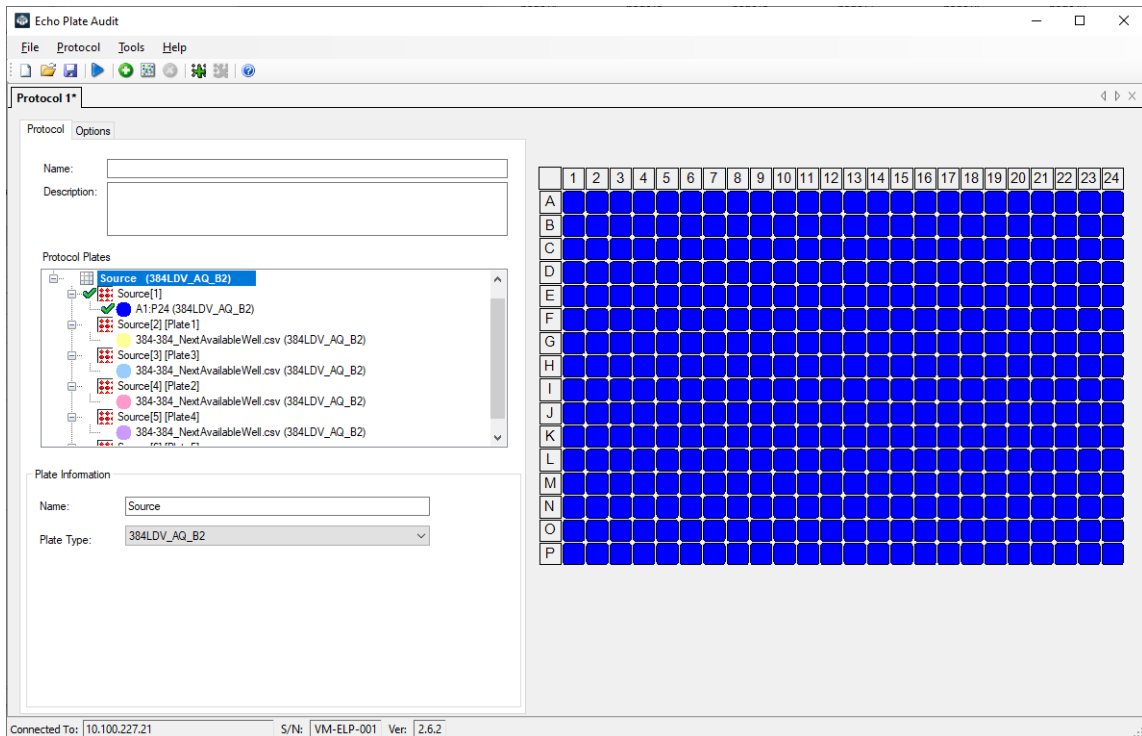
The table below describes the buttons/fields in the **Protocol Information** section and their functionality.

Table 5.3 Callout table for Protocol Information section

Callout Number	Name	Description
	Survey Area	Defines the survey area for the source plates. • Optimize Region — Surveys the minimum number of wells while trying to minimize the survey time. • Bounding Region — The rectangular region bounding all the user-selected regions should be surveyed. • Whole Plate — The entire plate should be surveyed regardless of the where the regions are defined.
	Repeat Survey	Defines the parameters for repeating a survey. • Number of repeats — The number of iterations a survey should be repeated. • Repeat Time Interval — The time interval between repeat surveys for a protocol.

In the **Protocol Plates** tree of the **Protocol** tab, if **Source** plate type is selected, the following settings become available:

Figure 5.14 Source plate type selected



The table below describes the buttons/fields in the **Plate Information** section and their functionality.

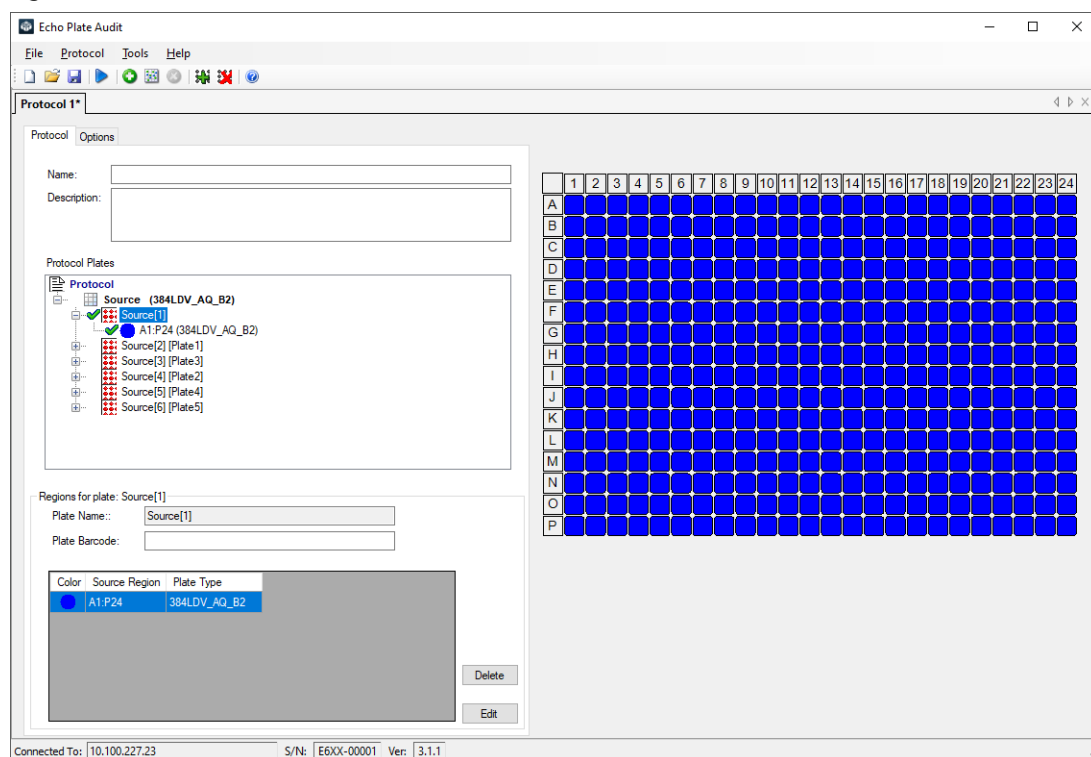
Table 5.4 Callout table for Plate Information section

Callout Number	Name	Description
1	Name	Name of the source plate.
2	Plate Type	Defines the plate type.

NOTE Changes are applied once cursor is removed from the field modified.

In the **Protocol Plates** tree of the **Protocol** tab, if a specific **Source** plate is selected, the following settings become available:

Figure 5.15 Source plate selected

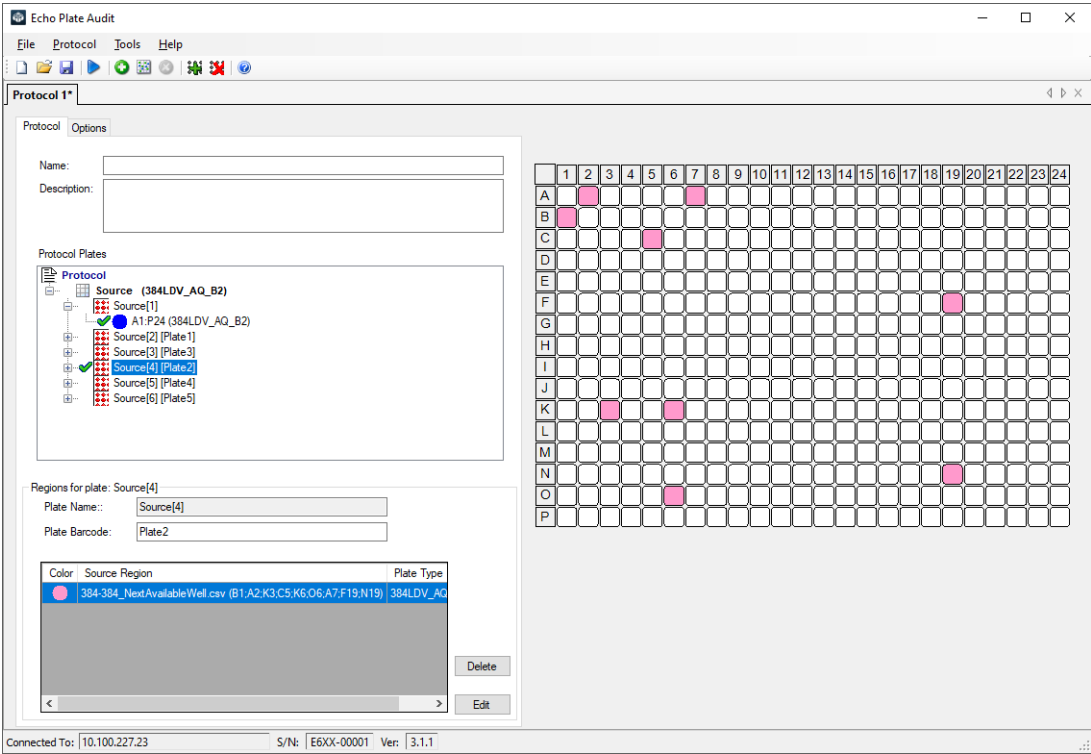


In the **Regions for Plate** box, the regions for the selected plate are listed. The user can click **Edit** to modify a region or **Delete** to remove a region from the plate.

NOTE If there are no regions for the plate, this list will be empty.

In the **Protocol Plates** tree of the **Protocol** tab, if a specific **Region** plate is selected, the following settings become available:

Figure 5.16 Region selected

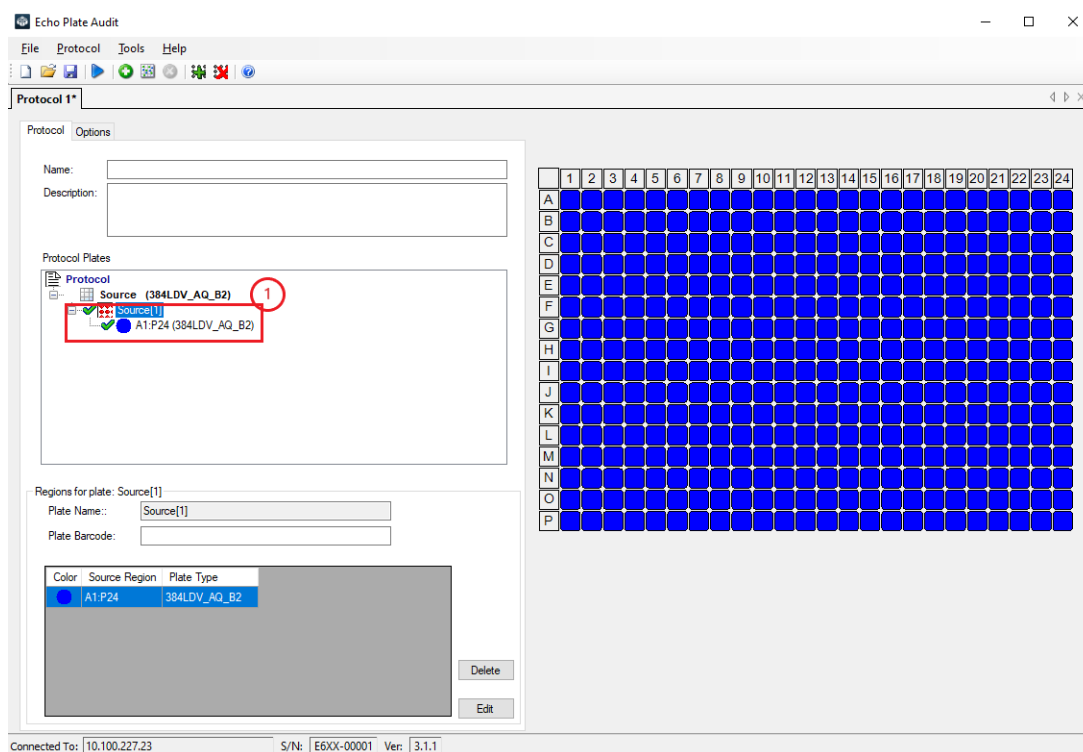


In the **Region Information** box, the wells and corresponding transfer volumes for the region for the selected plate are listed. These values are specified in the .csv file for the pick list.

Add Plate

The **Add Plate** command allows a user to add a new plate to the protocol.

Figure 5.17 Main Protocol Window Before Add Plate Executed



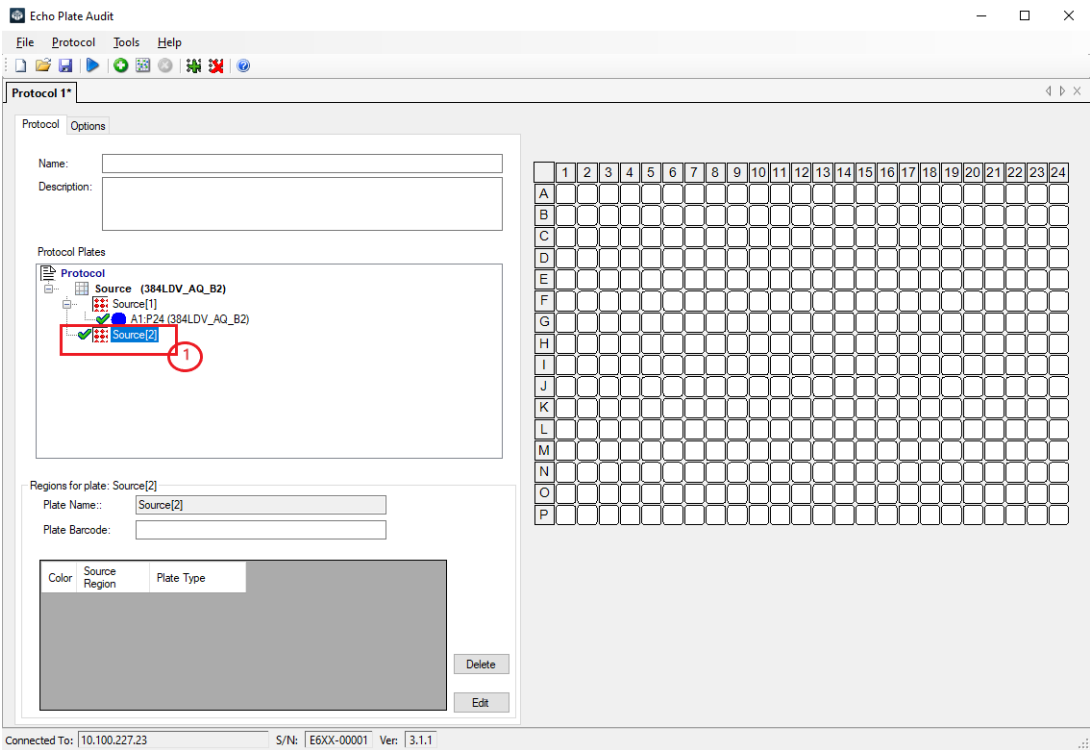
The table below describes the callout(s) in the **Protocol** tab.

Table 5.5 Callout table for Protocol tab

Callout	Name	Description
1	N/A	Initial source plate is present

To add a new plate, in the **main Protocol** window, select **Source** and click the **Add Source Plate**  icon or select the **Protocol > Add Plate** menu option.

Figure 5.18 Main Protocol Window After Add Plate executed



The table below describes the callout(s) in the **Protocol** tab.

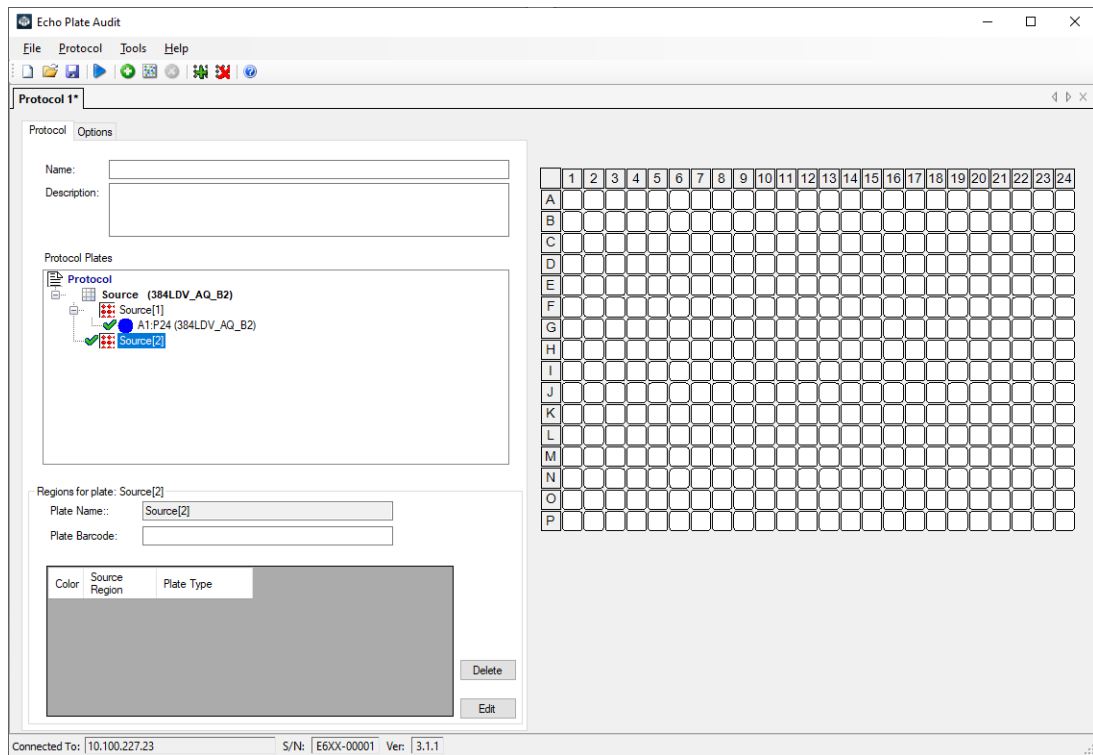
Table 5.6 Callout table for Protocol tab

Callout	Name	Description
1	N/A	Second source plate added. Regions need to be added separately.

Delete Plate

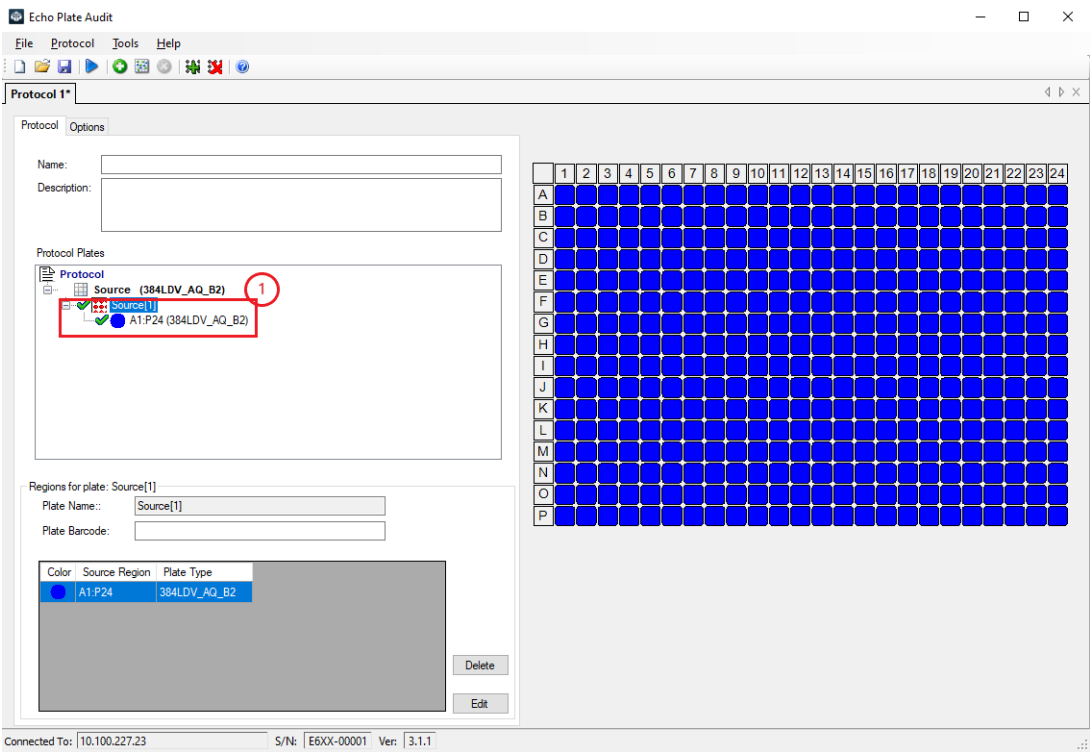
The **Delete Plate** command allows a user to delete a plate from the protocol.

Figure 5.19 Main Protocol Window Before Delete Plate Executed



To delete a plate, in the **main Protocol** window, select the **Source** to be deleted and click the **Delete Source Plate**  icon or select the **Protocol > Delete Plate** menu option.

Figure 5.20 Main Protocol Window After Delete Plate Executed



The table below describes the callout(s) in the **Protocol** tab.

Table 5.7 Callout table for Protocol tab

Callout	Name	Description
1	N/A	Delete the Source [2] source plate that was added in the previous example.

Select Region

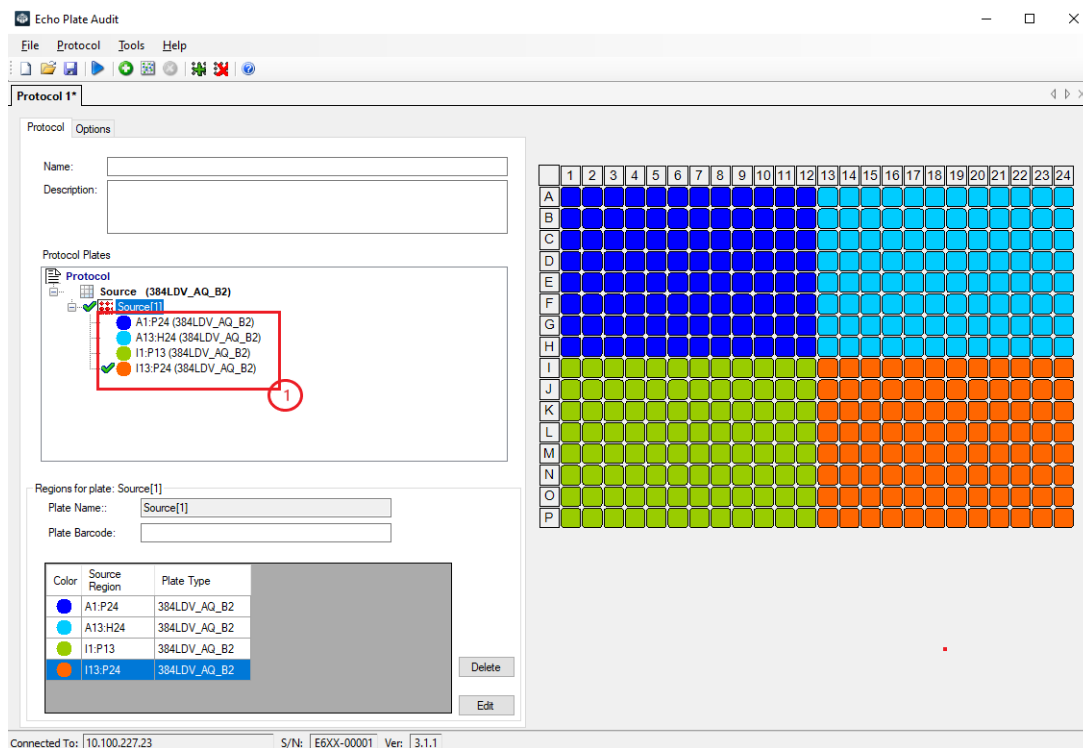
A region must be selected before it can be added or replicated. There are different ways to select wells:

- Click top-left corner to select all the wells in the plate.
- Click on a number (1-24) to select all the wells in that column.
- Click on a letter (A-P) to select all the wells in that row.
- Click and drag to select specific wells.

Add Region

The **Add Region** command allows the user to add a region to a source plate.

Figure 5.21 Main Protocol Window Before Add Region Executed



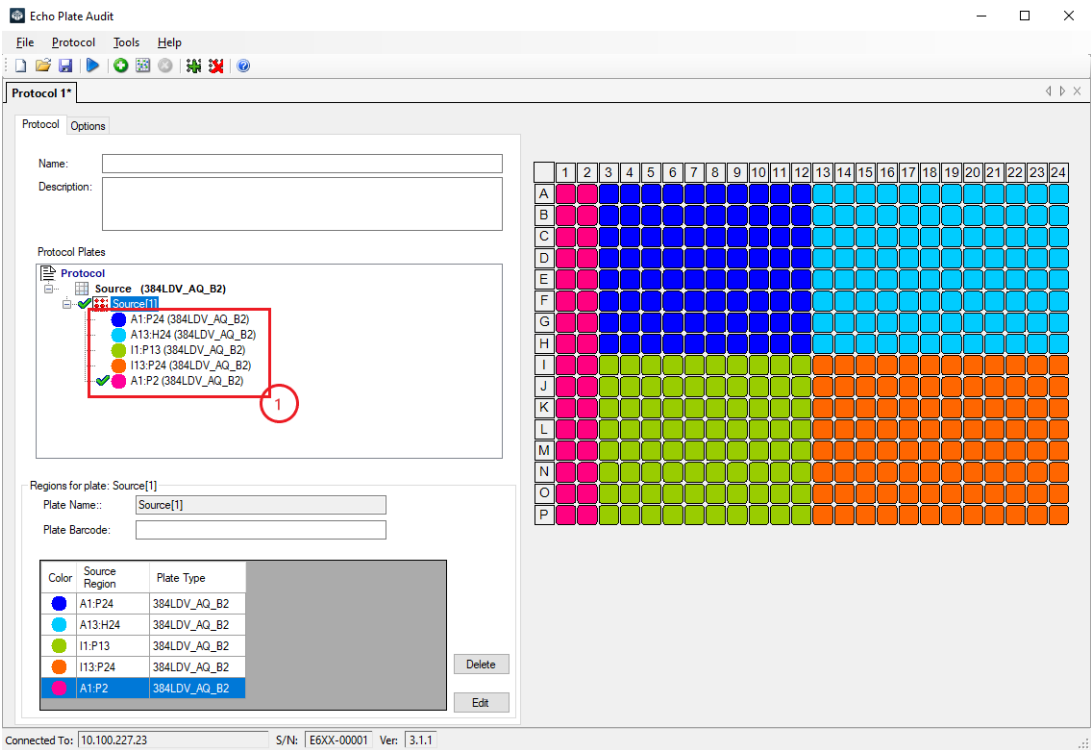
The table below describes the callout(s) in the **Protocol** tab.

Table 5.8 Callout table for Protocol tab

Callout	Name	Description
1	N/A	There are 4 regions in Source [1] source plate.

To add a region to a plate, in the **main Protocol** window, select the **Source** plate to add the region to, and click the **Add region**  icon or select the **Protocol > Add Region** menu option.

Figure 5.22 Main Protocol Window After Add Region Executed



The table below describes the callout(s) in the **Protocol** tab.

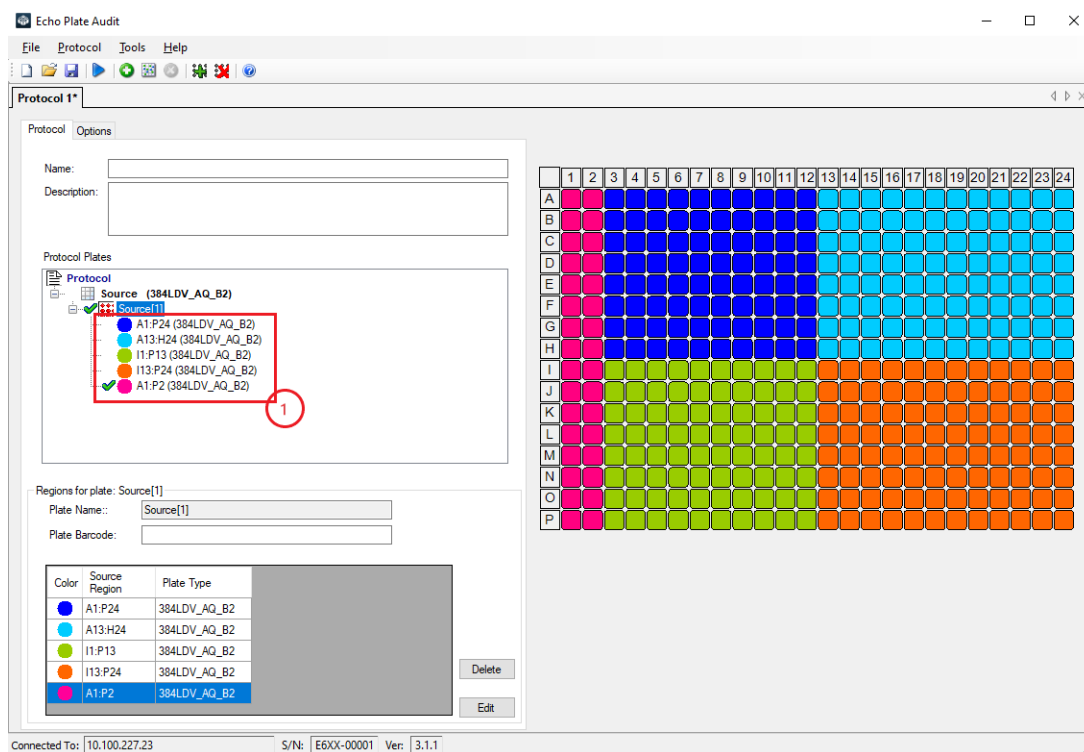
Table 5.9 Callout table for Protocol tab

Callout	Name	Description
1	N/A	Now there are 5 regions in Source [1] source plate.

Delete Region

The **Delete Region** command allows the user to delete a selected region.

Figure 5.23 Main Protocol Window Before Delete Region Executed



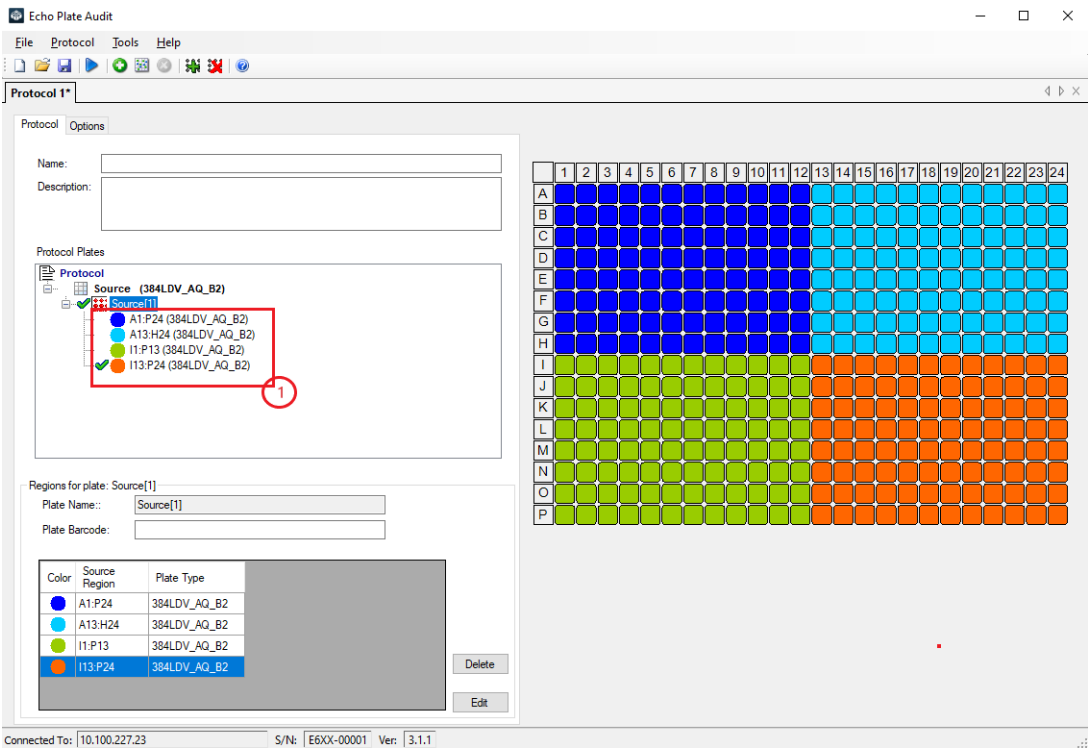
The table below describes the callout(s) in the **Protocol** tab.

Table 5.10 Callout table for Protocol tab

Callout	Name	Description
1	N/A	Delete the region added in the previous example.

To delete a region, in the **main Protocol** window, select the region in the **Source** plate to be deleted and click the **Delete Region**  icon or select the **Protocol > Delete Region** menu option.

Figure 5.24 Main Protocol Window After Delete Region Executed



The table below describes the callout(s) in the **Protocol** tab.

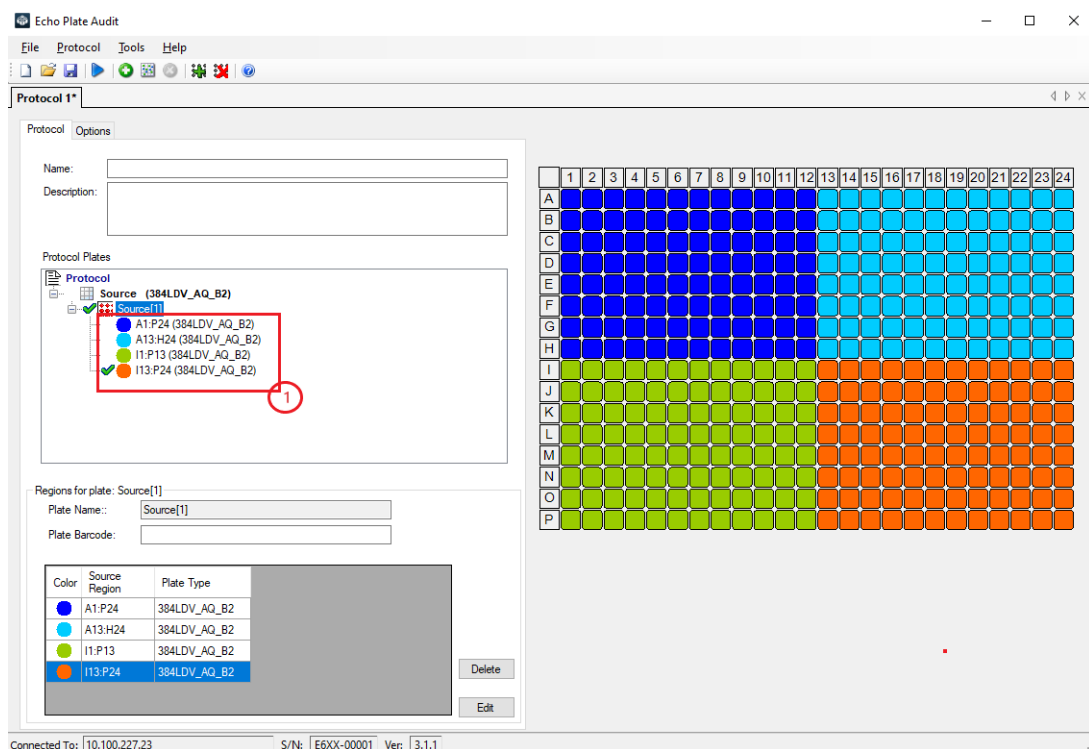
Table 5.11 Callout table for Protocol tab

Callout	Name	Description
1	N/A	Region 5 has been deleted.

Delete All Regions for Plate

The **Delete All Regions for Plate** command allows the user to delete all the regions for the selected plate.

Figure 5.25 Main Protocol Window Before Delete All Regions for Plate Executed



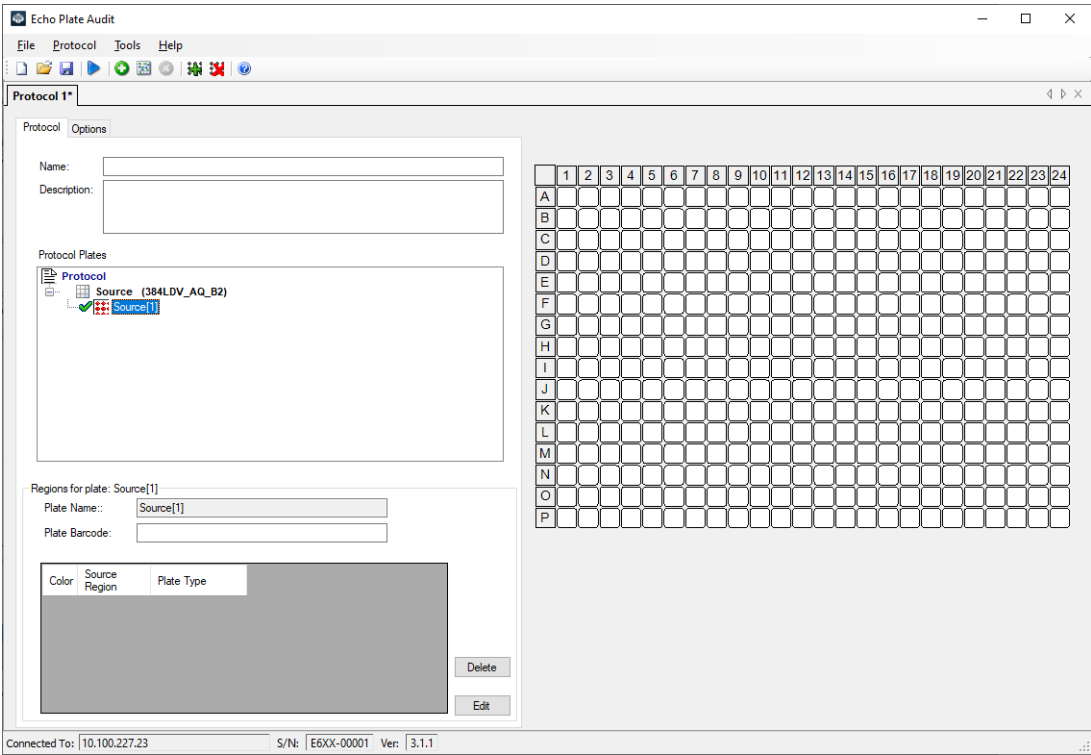
The table below describes the callout(s) in the **Protocol** tab.

Table 5.12 Callout table for Protocol tab

Callout	Name	Description
1	N/A	The four regions for Source [1] plate will be deleted.

To delete all the regions in a plate, in the **main Protocol** window, select the **Source plate** whose regions should be deleted and select the **Protocol > Delete All Regions for Plate** menu option.

Figure 5.26 Main Protocol Window After Delete All Regions for Plate Executed



The table below describes the callout(s) in the **Protocol** tab.

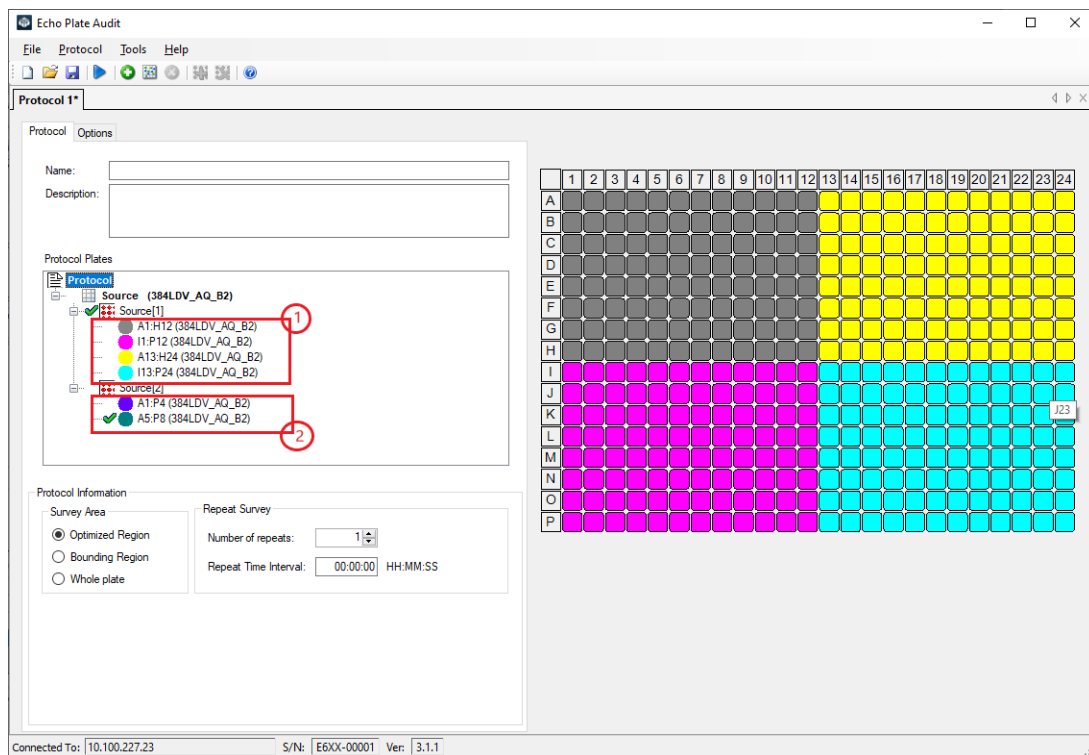
Table 5.13 Callout table for Protocol tab

Callout	Name	Description
1	N/A	Source [1] plate has no regions now.

Delete All Regions

The **Delete All Regions** command allows the user to delete all the regions for all the plates with one command.

Figure 5.27 Main Protocol Window Before Delete All Regions executed



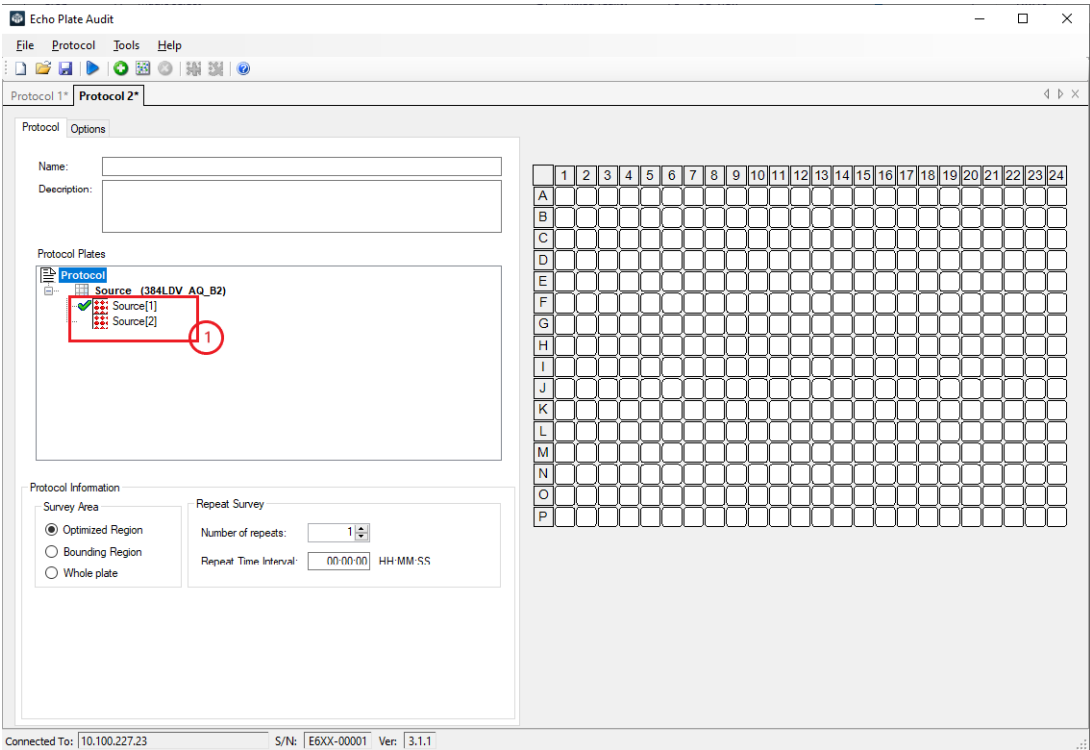
The table below describes the callout(s) in the **Protocol** tab.

Table 5.14 Callout table for Protocol tab

Callout	Name	Description
1	N/A	There are four regions for Source [1] plate.
2	N/A	There are two regions in Source [2] plate.

To delete all the regions for all the plates, in the **main Protocol** window, select **Source** and select the **Protocol > Delete All Regions** menu option.

Figure 5.28 Main Protocol Window After Delete All Regions Executed



The table below describes the callout(s) in the **Protocol** tab.

Table 5.15 Callout table for Protocol tab

Callout	Name	Description
1	N/A	All four regions for Source [1] plate and two regions for Source [2] plate have been deleted.

Error Check

The **Error Check** command allows the user to check the protocol for inconsistent information.

To check the current protocol for errors, in the **main Protocol** window, select the **Error Check** menu option.

Run

The **Run** command initiates the survey protocol that is displayed.

To run the current survey protocol, in the **main Protocol** window, click the **Run**  icon or select the **Protocol > Run** menu option. For more information, see [Run Protocol](#).

Protocol Options Tab

The **Protocol/Options** window is accessible by clicking the **Options** tab behind the **Protocol** tab. This window enables the user to customize the survey, output, rule, and reporting options for the Echo Plate Audit application. These settings are automatically used for the protocol created.

Each of the sections in the **Protocol Options Tab** is explained in the following topics.

- [Understanding Protocol Options](#)
- [Understanding Output Options](#)

Understanding Protocol Options

The **Protocol/Options** window displays the following protocol and output options.

Figure 5.29 Options tab

The screenshot displays the 'Options' tab of the 'Protocol/Options' window. It contains several sections for configuring the application:

- Protocol Options**
 - Surveys**: Radio buttons for 'Re-Survey every source plate' (selected) and 'Maintain survey history'.
- Output Options**
 - Output Files**: Radio buttons for 'Run-specific' (selected) and 'Plate-specific (affected by processing order)'.
- Rule Definition**
 - Error Rule...**: <DEFAULT>
 - Warning Rule...**: <DEFAULT>
- Rule Validation Reports**
 - Save reports as file type:** Checkboxes for XML (checked), CSV (checked), and TXT (unchecked).
 - Format...**: <DEFAULT>
 - Directory...**: <DEFAULT>
 - Filename...**: <DEFAULT>
- Survey Reports**
 - Save reports as file type:** Checkboxes for XML (checked), CSV (checked), and TXT (unchecked).
 - Format...**: <DEFAULT>
 - Directory...**: <DEFAULT>
 - Filename...**: <DEFAULT>

NOTE The options settings are similar to the **Preferences/Options** window, but apply only to the protocol displayed.

Surveys

There are two ways to manage survey history:

- **Re-Survey every source plate** — Default setting that automatically surveys the source plate every time the protocol is run. Survey history is saved, but not referenced each time.
- **Maintain survey history** — Used to store survey data for source plates.

With **Maintain survey history** chosen, information from the initial survey is referenced for subsequent transfers — eliminating the requirement to resurvey.

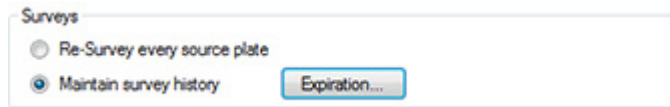
This feature can reduce processing time during a protocol run — particularly if the source plate is swapped several times during a protocol run. The user can specify the length of time that the survey data is retained, from a few minutes to never resurvey.

The software stores the survey data by plate barcode; therefore, the data is independent of the protocol and can be used across different protocols until the expiration time.

NOTE For additional information, read the user note *"How Long Will A Survey Last When Performing Acoustic Droplet Ejections?"* or [contact us](#).

The **Maintain survey history** function is located in the **Options** tab.

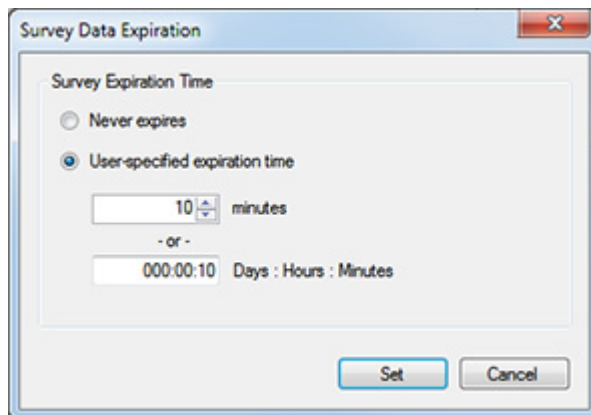
Figure 5.30 Surveys box



If the user selects **Maintain survey history**, an **Expiration** button appears.

Click **Expiration** to open the **Survey Data Expiration** dialog box and set the expiration values.

Figure 5.31 Survey Data Expiration dialog box



The following parameters can be set in the **Survey Data Expiration** dialog box:

- **Never expires** — Existing survey data is always re-used.

- **User-specified expiration time** — Existing survey data is re-used for the time that is specified in **minutes** or **Days:Hours:Minutes**.

NOTE If a stored survey does not cover the plate area that is required by the protocol (for example, some of the wells were empty when the plate was originally surveyed, but then filled later on), the software will survey the new wells and add this data to the stored survey data.

The stored survey data is instrument-specific. For example, if a source plate is surveyed in instrument A, the stored survey data cannot be used in instrument B.

Although survey history can be used indefinitely, it is not recommended.

Understanding Output Options

The output options are explained in the following topics:

- [Output Files](#)
- [Survey and Rule Validation Reports](#)
- [Rule Definitions](#)

Output Files

The **Output Files** box in the **Options** window organizes the survey results according to the following criteria:

Figure 5.32 Output Files options



The following parameters can be set for output files:

- **Run-specific** — All protocol data is stored in one file, in the order that the results are generated.
- **Plate-specific** — Protocol data is stored in separate files, based on source plates, depending on the process order specified in the **main Protocol** window.

Survey and Rule Validation Reports

File Type

Survey and rule validation results can be saved to the following file formats that are compatible with most laboratory information systems:

- **XML** (extensible markup language)
- **CSV** (comma separated values)
- **TXT** (text file)

The results are saved in the formats selected, and stored in the directory specified in the **Directory** option.

Report Format

The survey and rule validation reports can be customized by clicking the **Format** button in the **Protocol Options** tab.

NOTE The *DEFAULT* settings in the **Rule Validation** and **Survey Reports** are from the **Preferences/Options** window.

Figure 5.33 Report Format Options

The screenshot shows the 'Echo Plate Audit Defaults' dialog box with the 'Options' tab selected. The dialog is organized into several sections:

- Protocol Options:** Contains a 'Surveys' section with two radio buttons: 'Re-Survey every source plate' (selected) and 'Maintain survey history'.
- Output Options:** Contains an 'Output Files' section with two radio buttons: 'Run-specific' (selected) and 'Plate-specific (affected by processing order)'.
- Rule Definition:** Contains two buttons: 'Error Rule...' and 'Warning Rule...'. To the right of each button is a blue hyperlink: 'Error Rule' and 'Warning Rule' respectively.
- Rule Validation Reports:** Contains a 'Save reports as file type:' section with three checkboxes: 'XML' (checked), 'CSV' (checked), and 'TXT' (unchecked). Below this are three buttons: 'Format...', 'Directory...', and 'Filename...'. To the right of each button is a blue hyperlink: 'Header: 8 Body: 10 Footer: 4', 'C:\Labcyte\Echo\Reports', and '\$AppName\$\RunDate\$\InstrSN\$ RuleReport \$RunID\$' respectively.
- Survey Reports:** Contains a 'Save reports as file type:' section with three checkboxes: 'XML' (checked), 'CSV' (checked), and 'TXT' (unchecked). Below this are three buttons: 'Format...', 'Directory...', and 'Filename...'. To the right of each button is a blue hyperlink: 'Header: 8 Body: 11 Footer: 4', 'C:\Labcyte\Echo\Reports', and '\$AppName\$\RunDate\$\InstrSN\$ \$RunType\$ \$SrcPlateName\$ \$Src...' respectively.

At the bottom of the dialog are two buttons: 'Save' and 'Cancel'.

The **Output Format Builder** dialog box shows all the report variables (left selection box) that can be added to the report format (right selection boxes). The list of variables changes with the report area selected. Information such as **Plate Summary**, **Error Well**, **OK Well**, **Warning Well** can also be included by selecting the respective check box.

Figure 5.34 Transfer Output Format Builder

The **Output Format Builder** dialog box is shown. On the left, a list of **Variables** includes: Classification Type, Current Fluid Height, Current Fluid Volume, Fluid, Fluid Composition, Fluid Type, Fluid Units, Rule Plate Status, Rule Well Status, Source Column, Source Plate Barcode, Source Plate Format, Source Plate Name, Source Plate Type, Source Row, Source Well, Survey Fluid Height, Survey Fluid Volume, and Survey Status. In the center, the **Add To** section has radio buttons for Header, Body (selected), and Footer, with an **Add** button below. On the right, the **Custom Report Format** section contains three lists of variables. The top list includes Run ID, Run Date/Time, Application Name, Application Version, Protocol Name, Order ID, and Reference ID, with checkboxes for **Include Plate Summary**, **Include Error Well**, **Include OK Well**, and **Include Warning Well**. The middle list includes Source Plate Name, Source Plate Barcode, Source Plate Type, Source Well, Survey Fluid Volume, Fluid Composition, Fluid Units, Fluid Type, Rule Well Status, and Rule Plate Status. The bottom list includes Instrument Name, Instrument Model, Instrument Serial Number, and Instrument Software Version. Each list has up, down, and delete icons to its right. At the bottom are **Reset to Default**, **Clear Report**, **OK**, and **Cancel** buttons.

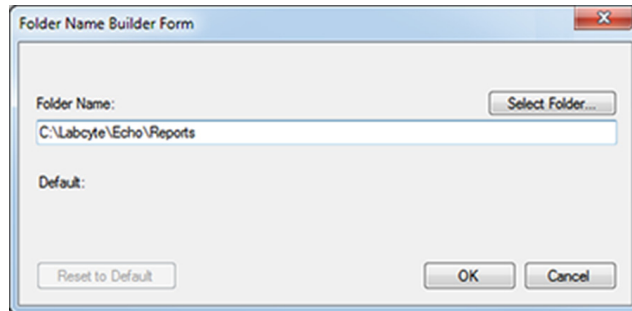
Figure 5.35 Survey Output Format Builder

The **Output Format Builder** dialog box is shown. On the left, a list of **Variables** includes: Classification Type, Current Fluid Height, Current Fluid Volume, Fluid, Fluid Composition, Fluid Type, Fluid Units, Source Column, Source Plate Barcode, Source Plate Format, Source Plate Name, Source Plate Type, Source Row, Source Well, Survey Fluid Height, Survey Fluid Volume, and Survey Status. In the center, the **Add To** section has radio buttons for Header, Body (selected), and Footer, with an **Add** button below. On the right, the **Custom Report Format** section contains three lists of variables. The top list includes Run ID, Run Date/Time, Application Name, Application Version, Protocol Name, Order ID, and Reference ID, with a checkbox for **Include Exception Report**. The middle list includes Source Plate Name, Source Plate Barcode, Source Plate Type, Source Well, Survey Fluid Height, Survey Fluid Volume, Current Fluid Volume, Fluid Composition, Fluid Units, Fluid Type, and Survey Status. The bottom list includes Instrument Name, Instrument Model, Instrument Serial Number, and Instrument Software Version. Each list has up, down, and delete icons to its right. At the bottom are **Reset to Default**, **Clear Report**, **OK**, and **Cancel** buttons.

Report Directory

The default report directory for both surveys is C:\Labcyte\Echo\Reports. A different directory can be specified by clicking the Directory button and entering a new location. Use the **Select Folder** button to browse to a different directory.

Figure 5.36 Folder Name dialog box



Report Filename

The Echo Plate Audit application uses the following default formats to report the survey and rule validation results:

Survey results file name —

\$AppName\$\RunDate\$\InstrSN\$_RunType\$_SrcPlateName\$(SrcPlateBarcode\$)

For example:

Echo Software\2018-02-20\E5XX-0001_Transfer_Plate 1(1-989992-0)

Rule Validation results file name —

\$AppName\$\RunDate\$\InstrSN\$_RunReport\$_RunID\$

For example:

Echo Software\2018-02-20\E5XX-0001_RuleReport_4567890

The survey and rule validation formats can be changed by clicking the **Format** button in the **Protocol Options** tab.

Figure 5.37 Rule Validation Filename Builder

The 'Filename Builder Form' dialog box features a list of variables on the left, including 'User Name', 'Application Name', 'Application Version', 'Protocol Name', 'Session ID', 'Run ID', 'Reference ID', 'Order ID', 'Run Date', 'Run Date/Time', 'Run Type', 'Run Status', 'Instrument Name', 'Instrument Model', 'Instrument Serial Number', 'Instrument Software Version', 'Instrument IP Address', 'Source Plate Name', 'Source Plate Type', 'Source Plate Barcode', and 'Source Plate Format'. The 'User Name' variable is selected. A '>>>' button is positioned to the right of the list. The 'Filename Template' field contains the text '\$AppNames\$\RunDates\$\InstrSNS_RuleReport_\$RunID\$'. Below this, the 'Example' field shows the resulting filename: 'Labcyte Echo Software\2018-02-20\E5XX-0001_RuleReport_4567890'. There are 'Clear' and 'Check Filename' buttons next to the example. A 'Default:' label is located below the example. At the bottom, there are 'Reset to Default', 'OK', and 'Cancel' buttons.

Figure 5.38 Survey Filename Builder

The 'Filename Builder Form' dialog box is identical to the one in Figure 5.37, but with a different filename template and example. The 'Filename Template' field contains the text '\$AppNames\$\RunDates\$\InstrSNS_RunType_\$SrcPlateName\$(\$SrcPlateBarcode\$)'. The 'Example' field shows the resulting filename: 'Labcyte Echo Software\2018-02-20\E5XX-0001_Transfer_Plate 1(1-989992-0)'. The 'Clear' and 'Check Filename' buttons are present next to the example. The 'Default:' label and the 'Reset to Default', 'OK', and 'Cancel' buttons at the bottom are also present.

Rule Definitions

Warning and error rules are used to define specific conditions that the user wants to flag for a specific protocol. These rules are typically created to help identify if a plate is viable for a certain process or not.

Error Rule

The **Custom Rule** dialog box is used to create rule definitions for error conditions.

Figure 5.39 Custom Rule dialog box for Error Rules

To customize error rule definitions:

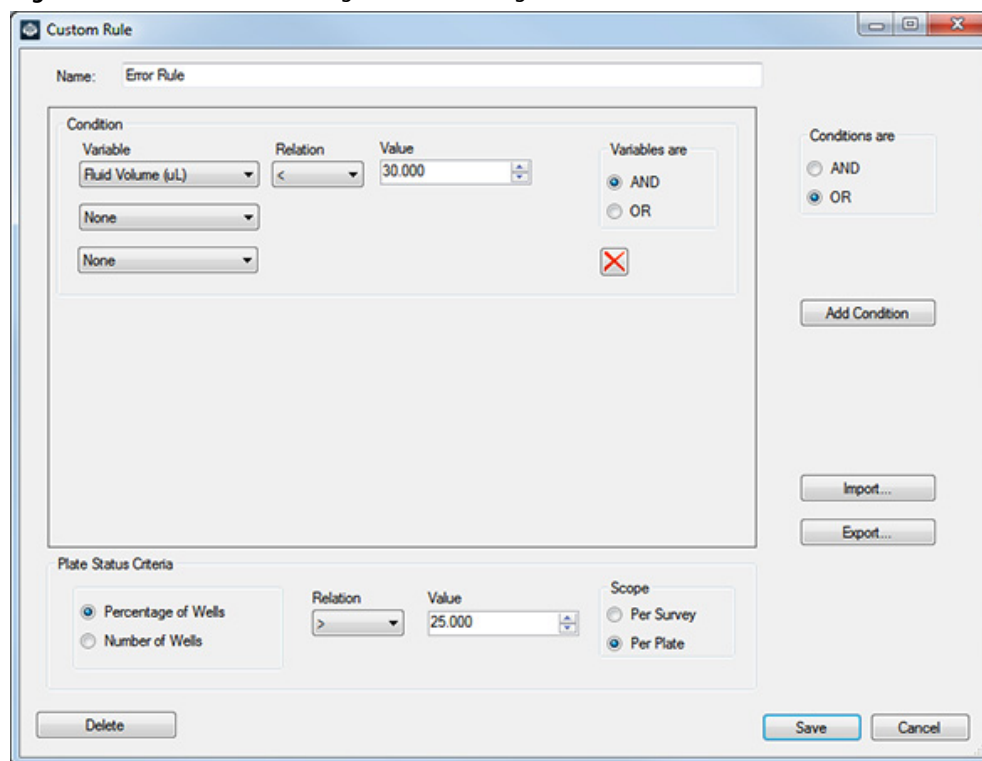
- 1 Click on **Error Rule** in the **Protocol/Options** window to create rule definitions for error conditions. The **Custom Rule** dialog box is displayed. If it's the first time a rule is being added, the **Default Rule** dialog box is displayed.
- 2 Click **Add Condition** to add a rule condition.
- 3 In the **Condition Information** section, choose a **Variable**, **Relation**, and **Value** for the first variable. Three variables can be added for a condition. **Variable** can be set to **None**, **Plate Type**, **Fluid Volume**, **Fluid Height**, **Fluid Composition**, or **Fluid Type**.
- 4 Select **AND** or **OR** to set how the **Variables** should be compared.
- 5 Click **Add Condition** to add additional conditions.
- 6 In the **Plate Status Criteria**, add a **Percentage of Wells** or **Number of Wells** condition per survey or per plate. Only one plate status criteria (percentage or number of wells) can be set. Similarly, the scope can be either per survey, or per plate. The **Relation** and **Value** should be set as needed.

- 7 Click the delete condition  icon to delete a condition.
- 8 Click **Import** to import a previously created .rul file.
- 9 Click **Export** to export the current rule to a .rul file.
- 10 Click **Delete** to delete the current rule and reset to default.
- 11 Click **Save** to save the custom rule or **Cancel** to close the dialog box without saving changes.

Warning Rule

Click on **Warning Rule** to create rule definitions for warning conditions.

Figure 5.40 Custom Rule dialog box for Warning Rules



The **Warning Rule** dialog box functions exactly like the **Error Rule** dialog box except it applies to warning rules instead of error rules.

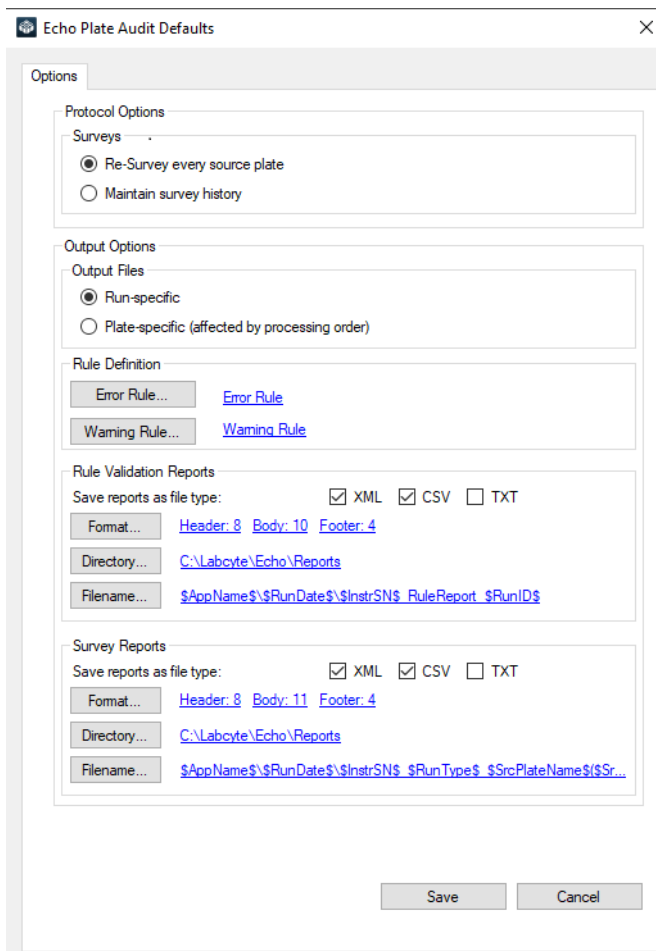
Preferences

The **Preferences/Options** window is accessible from the **Tools** menu. This window is very similar to the **Protocol Options** tab, but with the following differences:

- Settings are automatically applied to all protocols created unless changes were made in the **Protocol Options** window (report formats shown as “default”).
- Accessible from the **Toolbar**.

When the user clicks **Preferences**, the **Options** window opens to display the following protocol and output options:

Figure 5.41 Preferences/Options Window



Labware Definitions

The Echo Plate Audit application relies on the Labware definitions resident in the Echo Liquid Handler database. New plate definitions can be added or existing plate definitions can be managed by selecting **Labware Definitions** from the **Tools** menu.

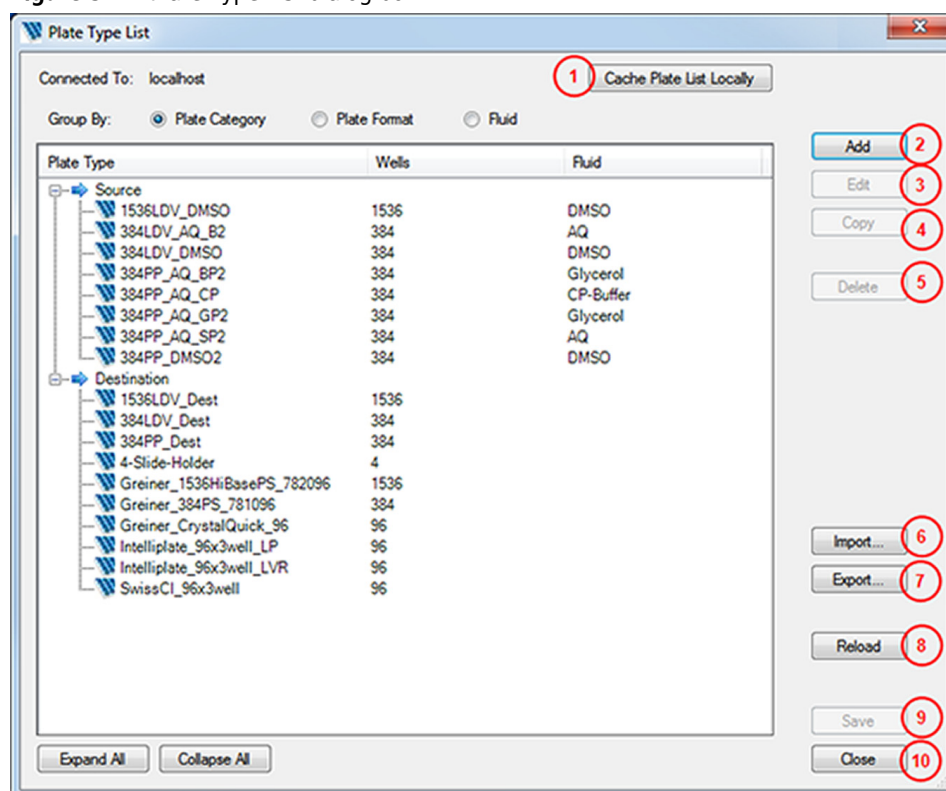
Each of the Labware topics are explained in the following topics.

- [Plate Type List](#)
- [Plate Type Editor](#)
- [Plate Export](#)

Plate Type List

The **Plate Type List** dialog box enables the user to add new plate definitions or manage existing ones.

Figure 5.42 Plate Type List dialog box



NOTE In case of an error message followed by a blank Plate Type List, connect to an Echo Liquid Handler or import the Labware file from the Echo Liquid Handler directory.

The table below describes the buttons/fields or sections in the **Plate Type List** dialog box and their functionality.

Table 5.16 Callout table for Plate Type List

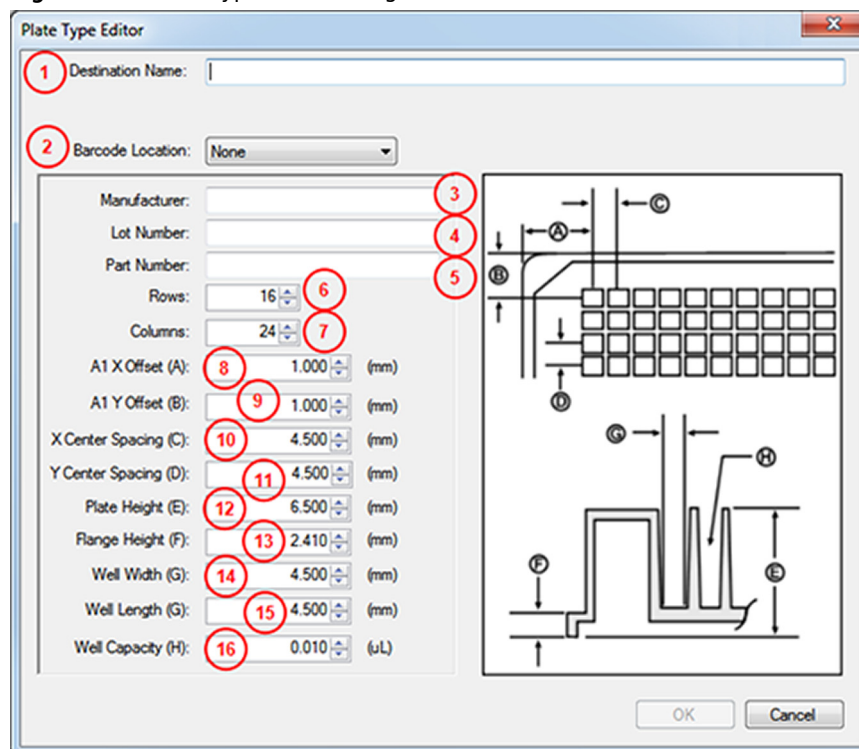
Callout Number	Name	Description
1	Cache Plate List Locally	Click this button to save the plate list from the Echo Liquid Handler to the Echo® Plate Audit Application.
2	Add	Adds a plate definition. Only a destination plate can be added. Refer to one of the following options: - Add a Labware definition from the Echo® Plate Audit Application. - Add a plate definition from the Echo Liquid Handler software and reload the updated Labware definition to the Echo® Plate Audit Application.
3	Edit	Edit a plate definition. Select a plate definition and click the Edit button. - Source plate definition: Only the barcode location of the source plate can be edited. - Destination plate definition: Edit any setting in the definition
4	Copy	Copy a plate definition. Select a plate definition and click the Copy button. The user can copy a source or destination plate definition. For a source plate definition, an alias or child plate is created with exact parameters as the parent plate except the user-defined fluid name. For a destination plate, a destination plate definition is created. Alternate source or destination plate names can be created by copying existing plate types.
5	Delete	Delete a plate definition. Select a plate definition and click the Delete button. The user can delete a destination plate definition or an alias or child plate definition previously created for a source plate but not a source plate definition.
6	Import	Import a single plate definition or group of definitions from a specific file location. The file must have an .elwx extension to be imported.
7	Export	Export a single plate definition or group of definitions. This includes any user created alias or child plate definitions for source plates and destination plate definitions that were created.
8	Reload	Reload the plate types that have been edited or deleted since the plate type list was last saved.
9	Save	Save any changes made to the plate type list, such as adding a new plate definition.
10	Close	Close the Plate Type List dialog box.

NOTE In case of an error message followed by a blank Plate Type List, connect to an Echo Liquid Handler or import the Labware file from the Echo Liquid Handler directory.

Plate Type Editor

The **Plate Type Editor** dialog box is similar to the **Plate Specification** window in the Echo Liquid Handler software.

Figure 5.43 Plate Type Editor dialog box



Source plate definitions — Source plate definitions require exact specifications to accurately transfer nanoliter volumes; therefore, they are defined specifically for the Echo Liquid Handlers and tested at Beckman Coulter (Echo-qualified). For this reason, source plates cannot be defined by the user. For existing source plates, only the barcode location can be edited. Contact Beckman Coulter to add more source plates.

Destination plate definitions — The Echo Liquid Handler is programmed with several compatible destination plates; however, the user can add destination plates through the Echo® Plate Audit Application or the Echo Liquid Handler software.

The table below describes the buttons/fields or sections in the **Plate Type Editor** dialog box and their functionality.

Table 5.17 Callout table for Plate Type Editor

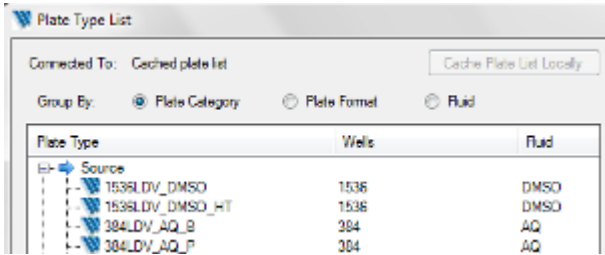
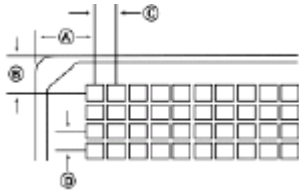
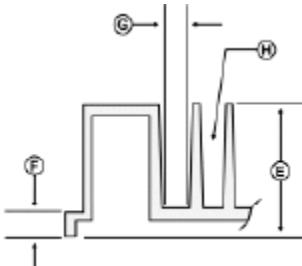
Callout Number	Name	Description
1		User-defined name to identify the plate. This name will be listed in the Plate Type List dialog box. 
2	Barcode Location	Location of barcode label on the destination plate: • None • Left • Right • Long
3	Manufacturer	Name of the plate manufacturer.
4	Lot Number	Lot number assigned by the plate manufacturer.
5	Part Number	Part number assigned by the plate manufacturer.
6	Rows	Number of rows in the microplate.
7	Columns	Number of columns in the microplate.
8	A1 X Offset	(A)* Distance from left outside edge to center of first column where the left edge of the part will be defined as the two 12.7 mm areas (as measured from the corners) as specified in ANSI SLAS 1-2004 (R2012). Valid range: 0.0 to 128.0 mm.
9	A1 Y Offset	(B) Distance from top outside edge to center of first row where the top edge of the part will be defined as the two 12.7 mm areas (as measured from the corners) as specified in ANSI SLAS 1-2004 (R2012). Valid range: 0.0 to 86.0 mm.
10	X Center Spacing (C)	Column spacing: Each following row/column shall be an additional X.Y mm in distance from the top/left outside edge of the plate as specified in ANSI SLAS 4-2004 (R2012). Valid range: 0.05 to 9.0 mm.
11	Y Center Spacing (D)	Row spacing: Each following row/column shall be an additional X.Y mm in distance from the top/left outside edge of the plate as specified in ANSI SLAS 4-2004 (R2012). Valid range: 0.05 to 9.0 mm. 
12	Plate Height (E)	The overall height of the plate as specified in ANSI SLAS 2-2004 (R2012). Valid range: 6.5 to 14.5 mm.

Table 5.17 Callout table for Plate Type Editor

Callout Number	Name	Description
13	Flange Height (F)**	The height of the flange (skirt) as specified in ANSI SLAS 3-2004 (R2012). Valid choices: 2.41 mm, 6.10 mm, and 7.62 mm.
14	Well Width (G)	The width of the well opening at the bottom (not an SLAS specified dimension. Valid range: 0.0 to 86.0 mm.
15	Well Length (G)	The length of the well opening (not an SLAS specified dimension. Valid range: 0.0 to 128.0 mm.
16	Well Capacity (H)	The overall capacity of the well in microliters. Valid range: greater than 0.0 μ l. 

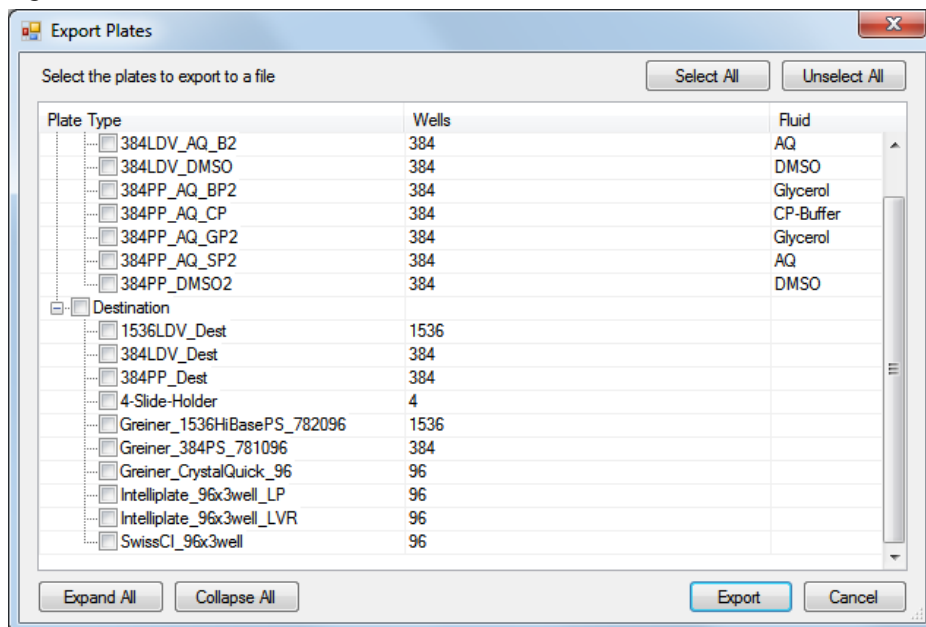
NOTE * The items marked A-G are measurements that need to be taken by hand or filled in from the manufacturer's specifications. These dimensions and further details on their definitions can be found at <https://www.slas.org/resources/information/industry-standards/>.

** Currently, the Echo Liquid Handler does not use dimensions F (flange height) and H (well capacity). Any value entered for flange height or well capacity is ignored.

Plate Export

The **Export Plates** dialog box displays the plates currently available in the Echo® Plate Audit Application. The user can select and export one or more plates to a file (.elwx file extension) for use in another application.

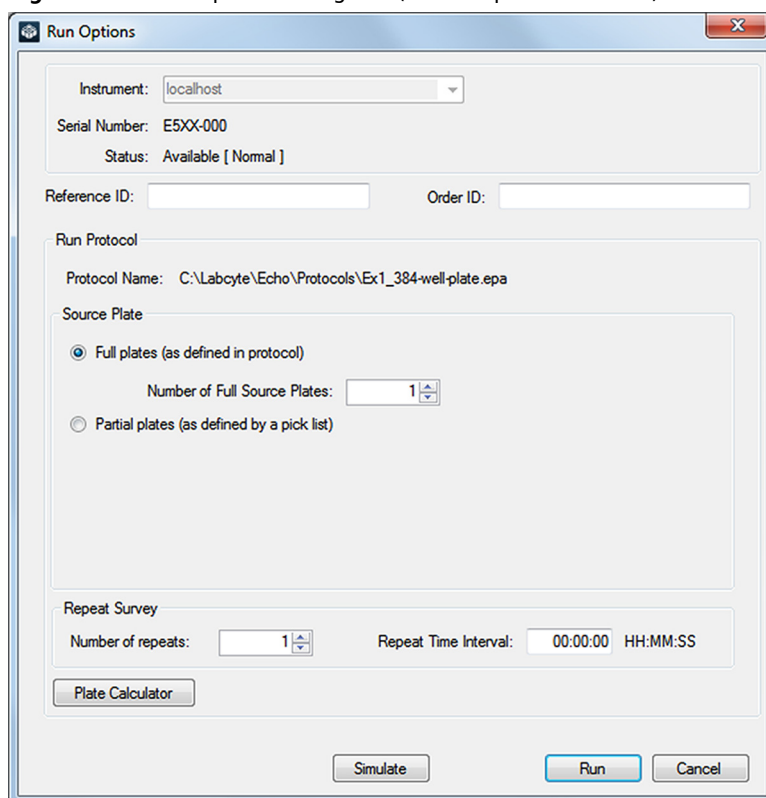
Figure 5.44 Export Plates dialog box



Run Protocol

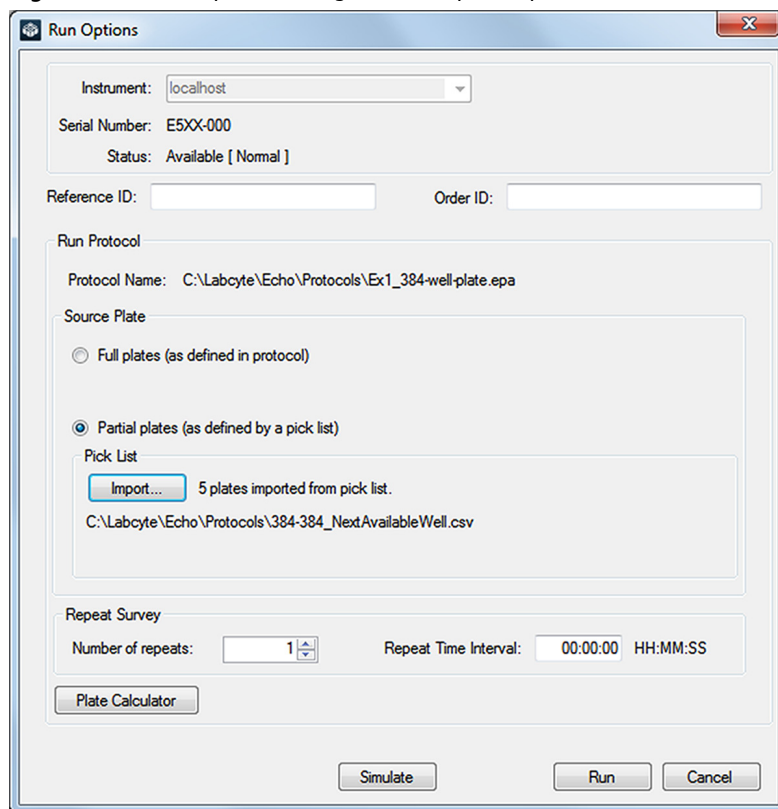
The **Run Options** dialog box enables the user to run a simulation of the survey protocol or run the survey protocol on the Echo instrument. If the application is not connected to an Echo instrument, this dialog box also provides a connection dialog box.

Figure 5.45 Run Options dialog box (with full plates selected)



The screenshot shows the 'Run Options' dialog box. At the top, there is a section for instrument information: 'Instrument:' with a dropdown menu showing 'localhost', 'Serial Number:' with the value 'E5XX-000', and 'Status:' with the value 'Available [Normal]'. Below this are two empty text boxes for 'Reference ID:' and 'Order ID:'. The main section is titled 'Run Protocol' and contains 'Protocol Name:' with the path 'C:\Labcyte\Echo\Protocols\Ex1_384-well-plate.epa'. Under 'Source Plate', there are two radio buttons: 'Full plates (as defined in protocol)' which is selected, and 'Partial plates (as defined by a pick list)'. Next to the selected radio button is a 'Number of Full Source Plates:' label and a spinner box set to '1'. Below this is a 'Repeat Survey' section with 'Number of repeats:' and a spinner box set to '1', and 'Repeat Time Interval:' with a text box showing '00:00:00' and the label 'HH:MM:SS'. At the bottom left is a 'Plate Calculator' button. At the bottom right are three buttons: 'Simulate', 'Run' (which is highlighted in blue), and 'Cancel'.

Figure 5.46 Run Options dialog box (with partial plates selected)

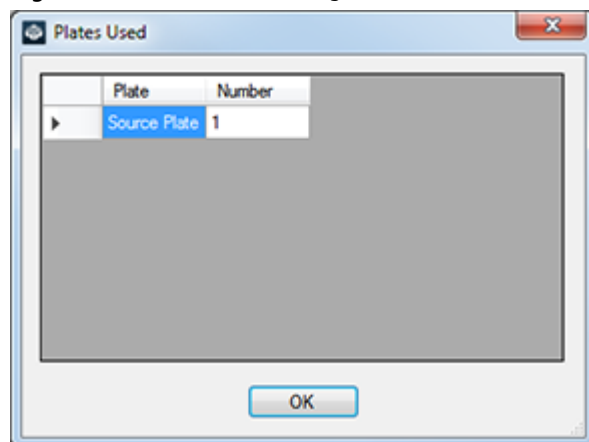


To run a protocol:

- 1 Select **Run** from the **Protocol** menu or click the **Run**  icon in the **Toolbar**.
- 2 Select the **Instrument** if it is not already selected.
- 3 Optionally, enter a **Reference ID** and/or **Order ID** to be used to reference the run in the output report files.
- 4 Select the **Full Plates** or **Partial Plates** option:
 - Choose the **Full Plates** option to pick the full plate. The **Full Plate** option is defined by the protocol, but the user must specify the number of source plates to process.
 - Choose the **Partial Plates** option to pick specific plates. When the **Partial Plates** option is selected, an **Import** button is displayed to import a .csv pick list indicating the wells to be surveyed. For more information on how to define a pick list, see [Importing a Pick List While Running a Protocol](#).

- 5 Change the value for **Number of repeats** to override the number of repeat surveys set for the protocol. Changing the **Repeat Time Interval** value will override the original setting in the protocol for the time delay between repeated surveys.
- 6 Click the **Plate Calculator** button to view the number of plates needed to run the protocol.

Figure 5.47 Plates Used dialog box



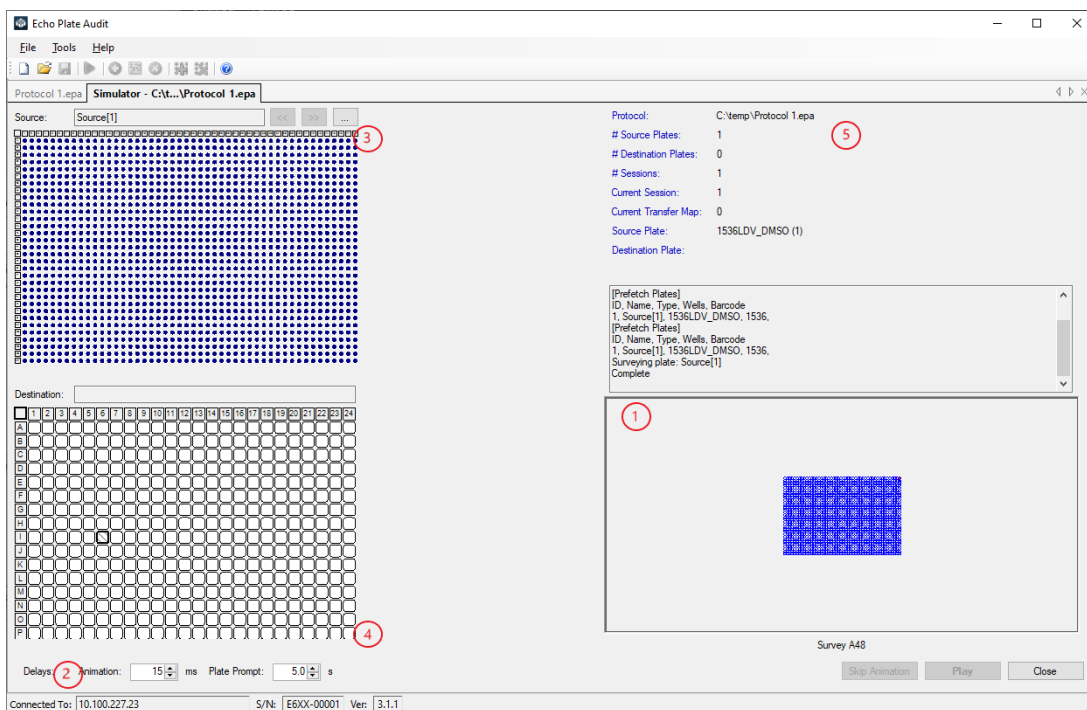
- 7 Optionally, click **Simulate** to test the survey protocol.
NOTE Running a simulation is recommended to verify the surveys defined in the protocol before a live run.
- 8 Click **Run** to execute the protocol.

Simulator Window

The simulator is an animation of fluid transfer for the selected protocol. The simulation is interactive and allows the user to respond to a prompt box to insert and remove plates. Since this is a simulation, the prompt box appears for only 5 seconds, then the software automatically responds to the prompt and continues to the next step.

The protocol example that is described in this help page uses a pick list of compounds in five source plates and a control plate transferring to a single destination plate. The components of the simulator window are described below.

Figure 5.48 Simulator Window



The table below describes the buttons/fields or sections in the **Simulator Window** and their functionality.

Table 5.18 Callout table for Simulator Window

Callout Number	Name	Description
1	Transfer Animation Box	Simulates the movement of the destination plate (green) as it receives liquid from the source plate. Each source-to destination well transfer is documented below the plates.
2	Delays	The following Delays commands are available to manage the transfer animation. • Animation (milliseconds) — Controls the speed of the simulated well-by-well transfer. Speed ranges from 500 ms to 0; default is 15 ms. Higher speeds are useful to slow down the animation when transfers jump around the plate. For example, during backfills. • Plate Prompt (seconds) — Controls the time interval that the plate prompt box is displayed, from 30 s to 0. Zero setting is useful to bypass the prompt box entirely and view the animation only. • Skip Animation — Bypasses the animation step and shows only the transfer results for that step. This control enables the user to quickly review the plate mapping after each transfer step. NOTE This control does not bypass plate prompts or bulk fill displays. • Play — Begins the simulated fluid transfer. • Close — Closes the simulation window. If a simulation is in progress, it will need to be canceled before the window can be closed.

Table 5.18 Callout table for Simulator Window

Callout Number	Name	Description
3	Source Plate Type Map Box	Shows the source plate that is selected for transfer. As the simulation runs, each source well shows the number of times a transfer is made from that well.
4	Destination Plate Type Map Box	Shows each well that receives transfers and the number of transfers that are received.
5	Protocol Information Box	Provides details about the transfer protocol, such as the number of plates that will be needed. As the simulation proceeds, this box is updated to show which plates are currently in use.

Run Status Window

The **Run Status** window is a dynamic window that provides control buttons to run the protocol, and various status windows to show the progress of the plate survey and the state of the Echo instrument.

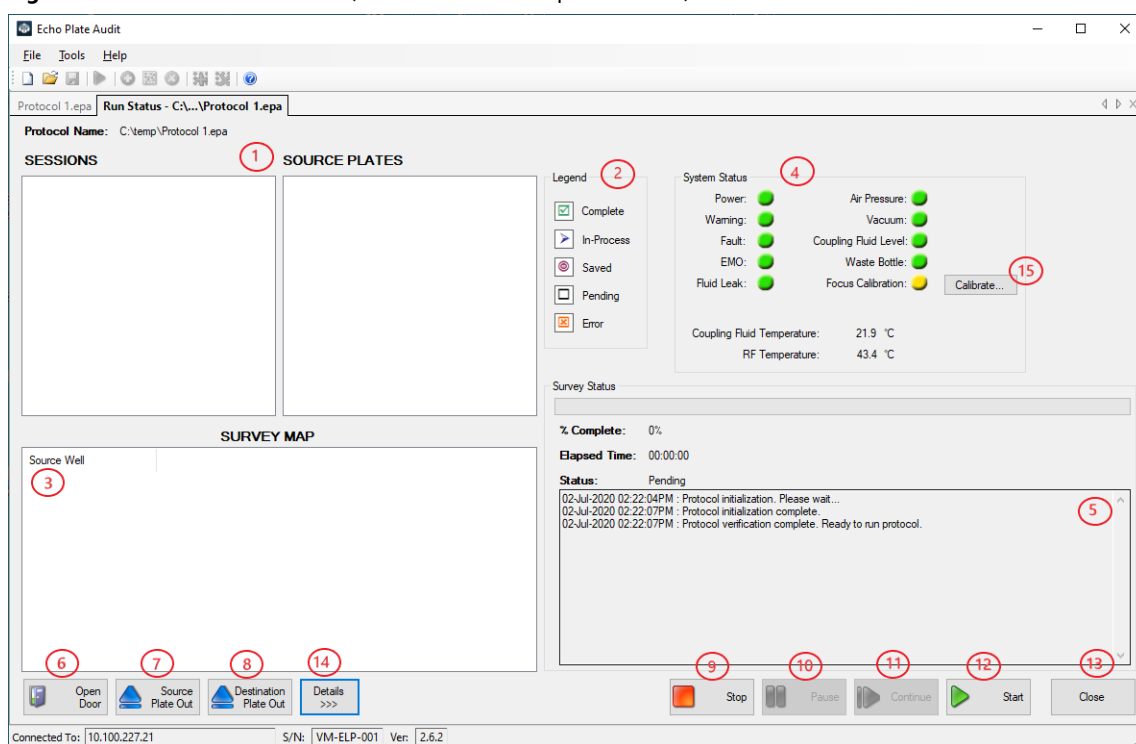
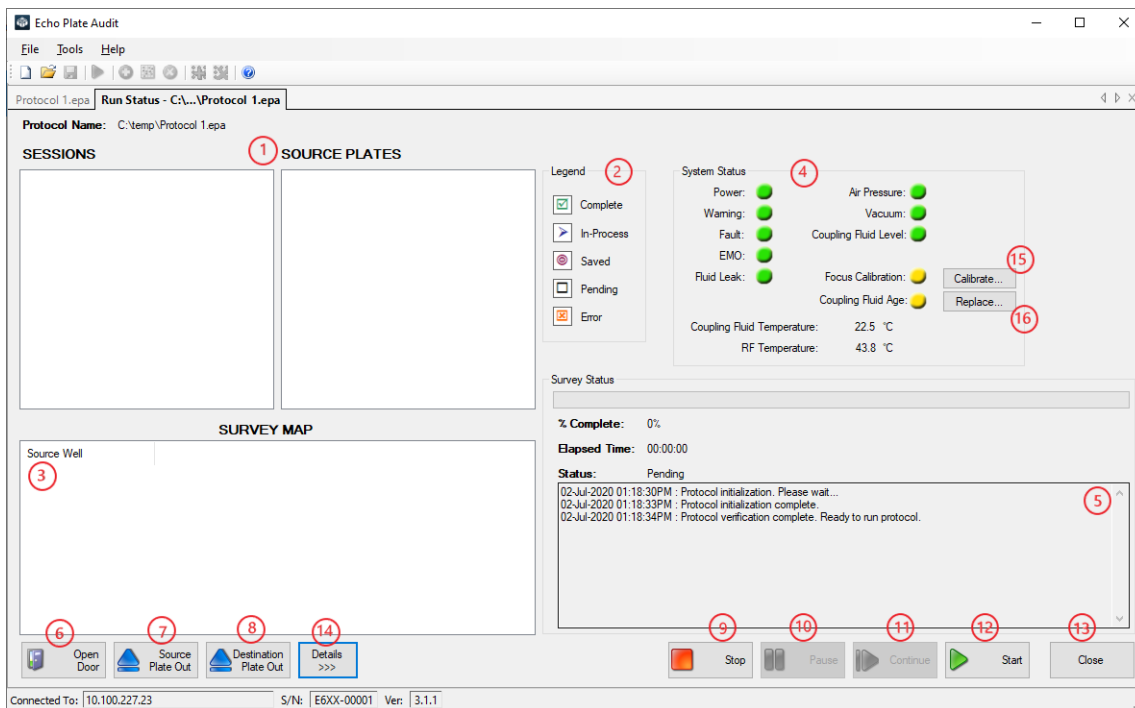
Figure 5.49 Run status window (Echo 55X Series Liquid Handler)

Figure 5.50 Run status window (Echo 650 Series Liquid Handler)



The table below describes the buttons/fields or sections in the Run Status window and their functionality.

Callout Number	Name	Description
1	Source and Destination Plate windows	Shows the status of each plate as it progresses through the transfer protocol. The Legend interprets the symbols used in the status windows.
2	Legend	Identifies each of the states (Complete, InProcess, Saved, Pending, Error) possible for a source and destination plate during a run.
3	Transfer Map window	Shows the details of each well-to-well transfer.
4	System Status window	Shows the status of the Echo instrument during the transfer run. If a problem occurs, an alert is indicated by the colors turning from green to yellow to red. If it is red, the user needs to do something to fix it.
5	Transfer Status window	Shows a progress bar of the transfer protocol, as well as percent completion and elapsed time. This section also provides a text window that displays all the actions that occur during the run.
6	Open Door button	Opens the process door of the connected Echo Liquid Handler.
7	Source Plate button	Extends the source plate gripper.
8	Destination Plate Out button	Extend the destination plate gripper.

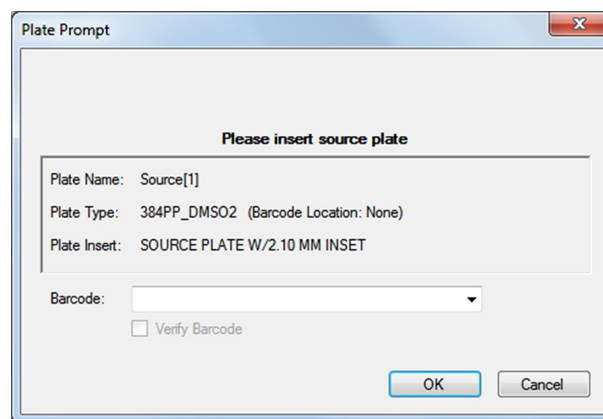
Callout Number	Name	Description
9	Stop button	Stops the transfer protocol that is in progress.
10	Pause button	Pauses the transfer protocol that is in progress.
11	Continue button	Continues the transfer protocol that is in progress.
12	Start button	Begins the transfer protocol.
13	Close button	Closes the Run Status window.
14	Details button	Shows the debugging information for the protocol run.
15	Calibrate button	Starts the focus calibration procedure.
16	Replace button	Starts the coupling fluid replacement procedure (only applies to the Echo 650 Series Liquid Handler).

Plate Prompt

The **Plate Prompt** boxes instruct the user to insert or remove a plate. The plate prompt steps are described below:

- 1 Insert source plate and click **OK**.

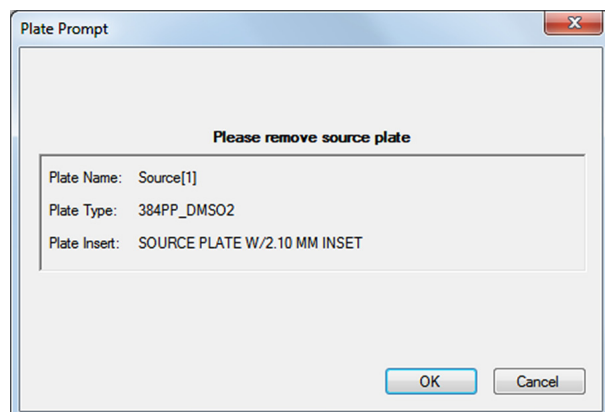
Figure 5.51 Insert source plate prompt box



NOTE For Echo 650 Series Liquid Handler instruments, the **Plate Insert** will always be **Universal Insert**.

- 2 Remove the source plate and click **OK**.

Figure 5.52 Remove source plate prompt box

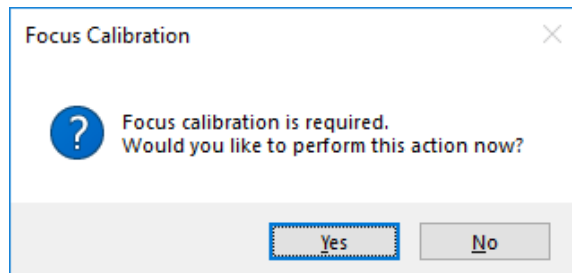


This process is followed for each source plate in the run set.

Focus Calibration

The **Focus Calibration** dialog box is automatically displayed when the user selects **Run** in the **Run Options** dialog box if the Echo Liquid Handler requires acoustic transducer calibration. This is also indicated by the yellow warning status indicator for **Focus Calibration** in the **System Status** section.

Figure 5.53 Focus Calibration Dialog Box



The Focus calibration procedure measures the focal length of the acoustic transducer and compares it to the previous measurement. If the difference between these measurements is minimal, then the system updates its calibration database with the new focal length and the procedure is finished. If the difference is larger than a preset threshold, users should call Beckman Service and Support to ensure the system is running properly before accepting the focal length new value.

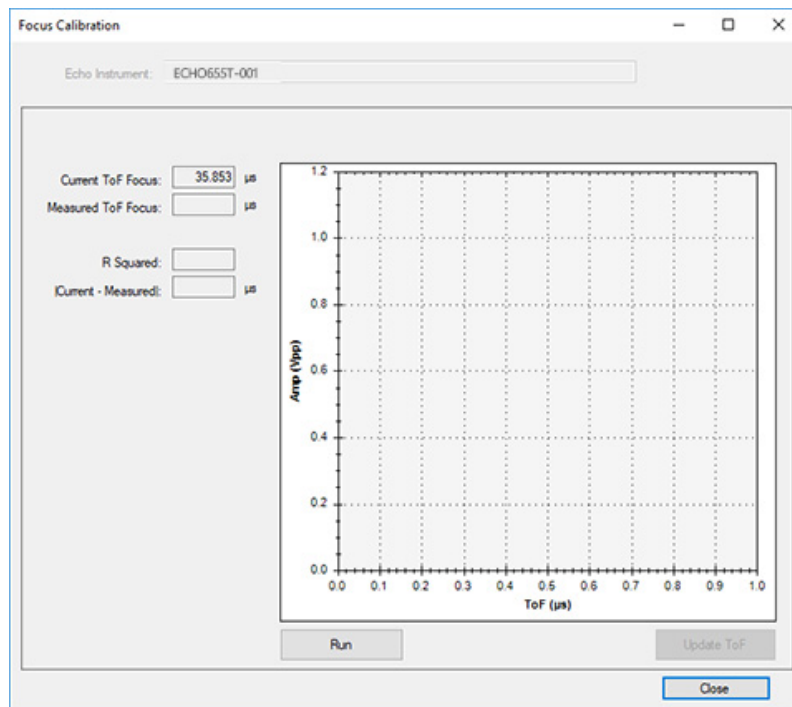
It is recommended to select **Yes** and follow the focus calibration steps. If you choose to delay the focus calibration, you can click the **Calibrate** button next to the **Focus Calibration** status indicator in the **System Status** section in the **Run Status** window to start the focus calibration steps.

To run the Focus Calibration procedure:

- 1 Click **Yes** to begin the **Focus Calibration** procedure. The **Focus Calibration** dialog box is displayed.

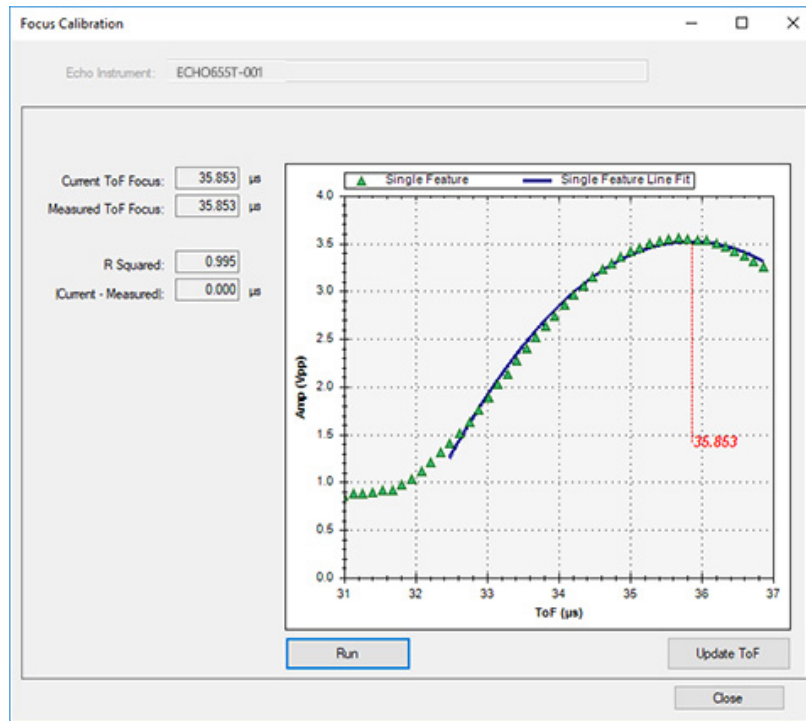
- 2 In the **Focus Calibration** dialog box, click **Run**.

Figure 5.54 Focus Calibration Dialog Box

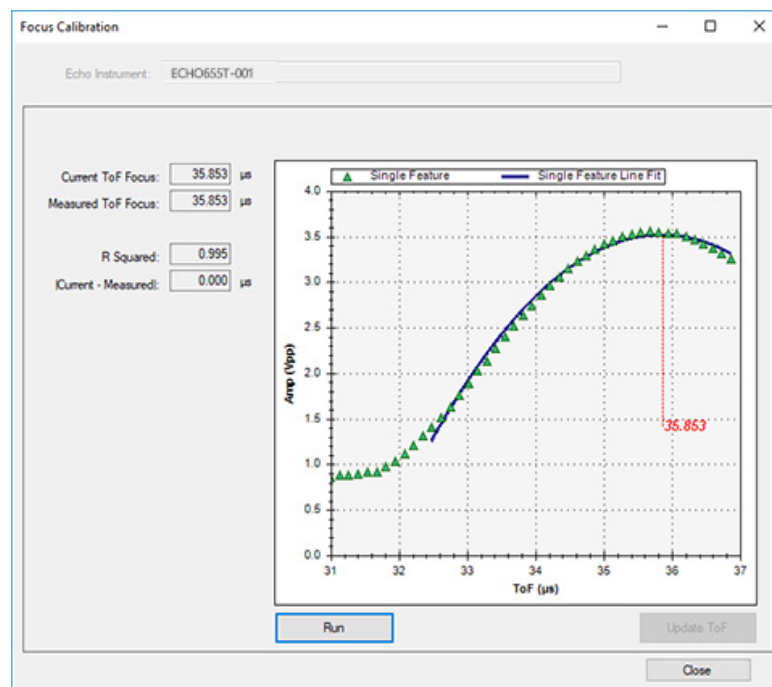


- 3 The new focus calibration values are displayed. If there are no errors, click **Update ToF** to update the focus calibration values. If the focus calibration values are outside the normal range, a red warning box is displayed indicating the focus calibration values are out of range. If the user clicks **Update ToF**, a confirmation dialog box is displayed to ensure the user is aware of committing calibration values that are out of range. Out of range focus calibration values should not be committed unless instructed by Beckman Service and Support.

Figure 5.55 Focus Calibration Dialog Box



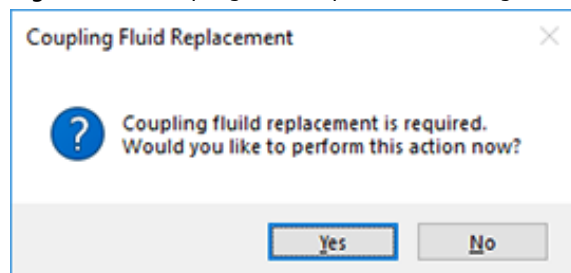
- 4 Once the focus calibration values have been committed, the **Update ToF** button is disabled. Click **Close** to exit the **Focus Calibration** dialog box.

Figure 5.56 Focus Calibration Dialog Box

Coupling Fluid Replacement

NOTE The coupling fluid replacement procedure is only required for the Echo 650 Series Liquid Handler.

The **Coupling Fluid Replacement** dialog box is automatically displayed when the user selects **Run** in the **Run Options** dialog box if the Echo Liquid Handler needs coupling fluid replacement. This is also indicated by the yellow warning status indicator for **Coupling Fluid Age** in the **System Status** section.

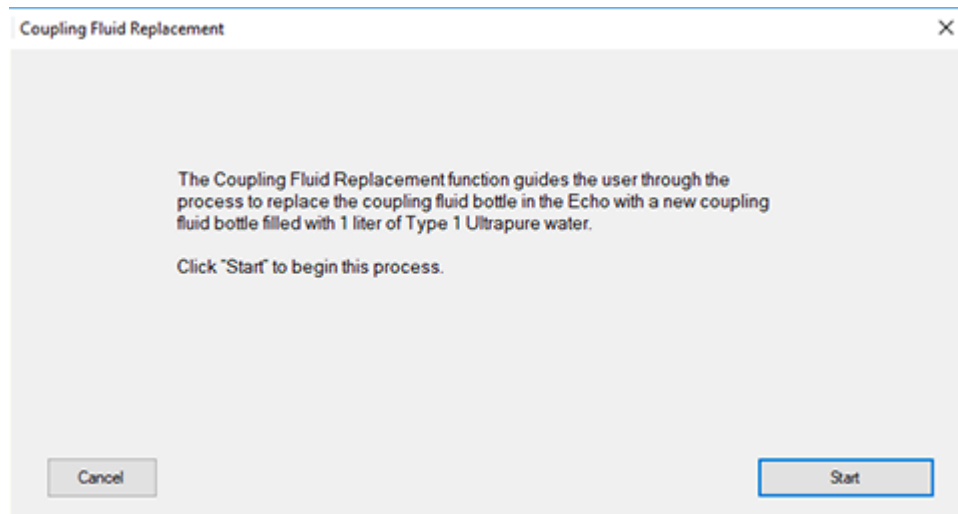
Figure 5.57 Coupling Fluid Replacement dialog box

It is recommended to select **Yes** and follow the coupling fluid replacement steps. If you choose to delay coupling fluid replacement, you can click the **Replace** button next to the **Coupling Fluid Age** status indicator in the **System Status** section in the **Run Status** window to start the fluid replacement steps.

To start the fluid replacement process:

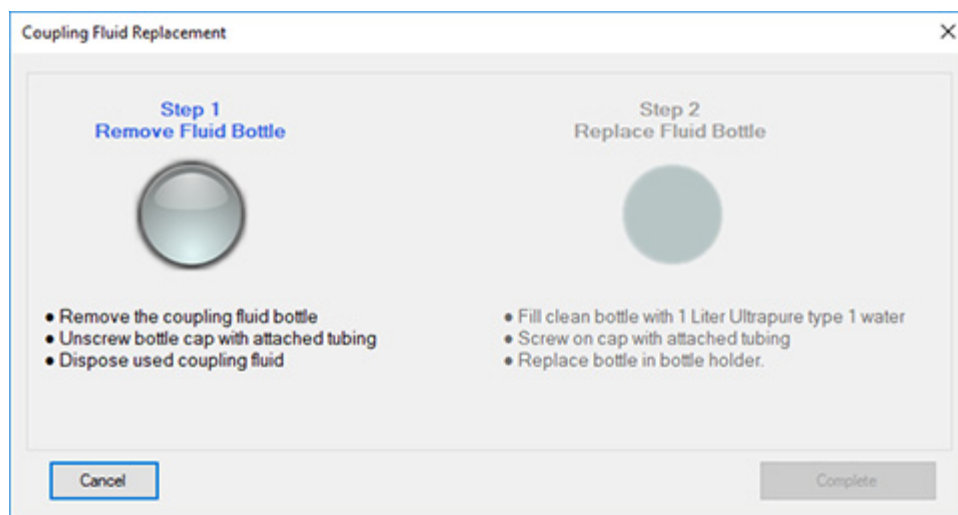
- 1 Click **Start** to begin the coupling fluid replacement process.

Figure 5.58 Coupling Fluid Replacement Start dialog box

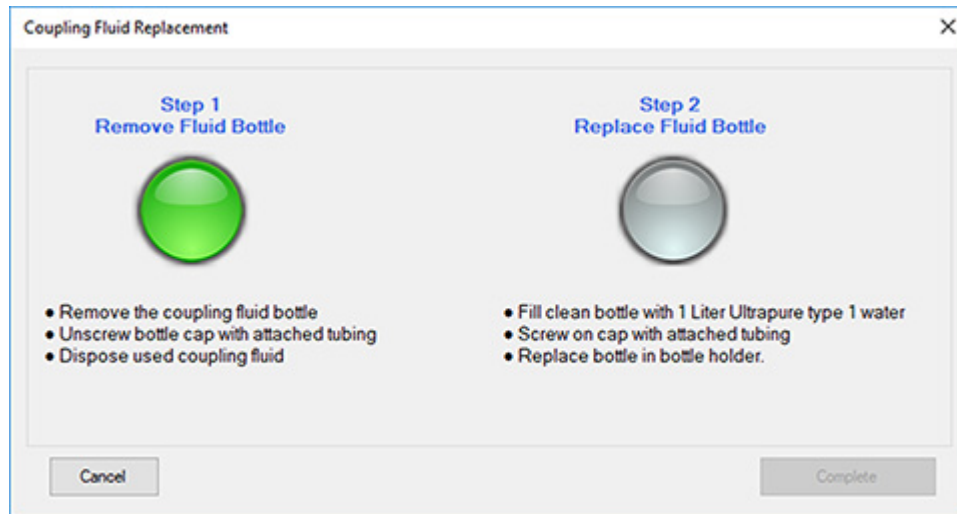


- 2 The **Fluid Replacement Workflow** is displayed and step 1 in the workflow is enabled. Go to the back of the Echo Liquid Handler and remove the coupling fluid bottle. Unscrew the bottle cap with the attached tubing and then dispose of the used coupling fluid fluid.

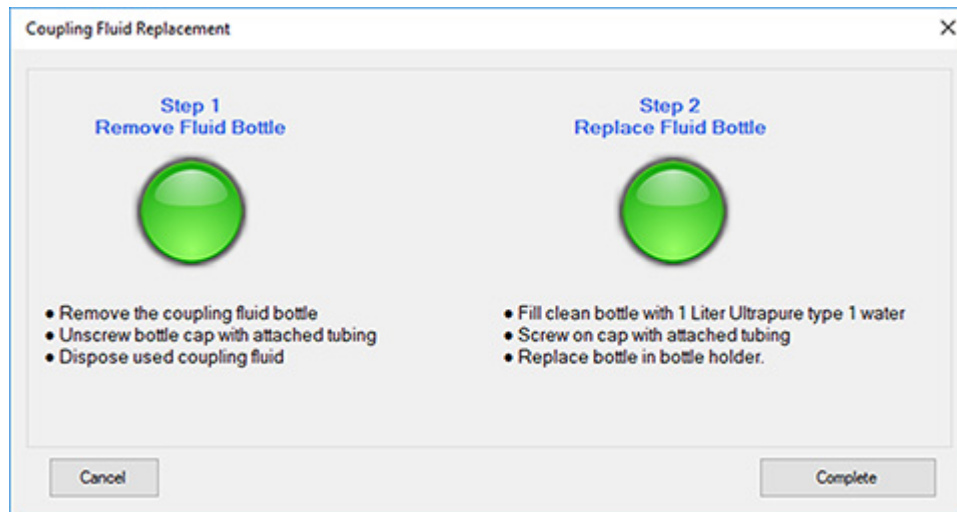
Figure 5.59 Coupling Fluid Replacement Workflow displayed



- 3 After the coupling fluid bottle has been removed, step 2 in the workflow is enabled.

Figure 5.60 Coupling Fluid Replacement Step 1

- 4 Fill a clean coupling fluid bottle with 1 Liter Ultrapure Type 1 water and screw on the bottle cap with the attached tubing. Then replace the coupling fluid bottle in the bottle holder.

Figure 5.61 Coupling Fluid Replacement Step 2

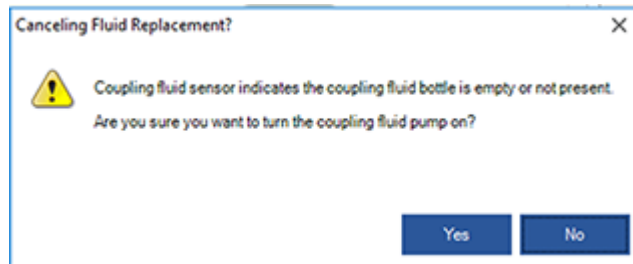
Once the fluid replacement process is started, if the user clicks the **Cancel** button and the coupling fluid level is sufficient, the following message box is displayed.

Figure 5.62 Canceling Fluid Replacement dialog box



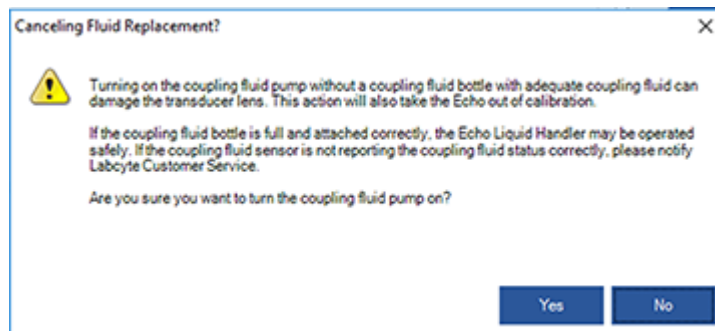
Once the fluid replacement process is started, if the user clicks the **Cancel** button and the sensor indicates that either the coupling fluid bottle is empty or not present, the following messages are displayed.

Figure 5.63 Canceling Fluid Replacement dialog box



A second dialog box is displayed to confirm if the user wants to end the fluid replacement process.

Figure 5.64 Canceling Fluid Replacement dialog box



-
- 5** If the user did not cancel the fluid replacement process, they can click the **Complete** button to finish the fluid replacement process and exit the **Coupling Fluid Replacement** dialog box.
-

Glossary

There are many terms used throughout this manual that refer to parts of the Echo Plate Audit application. It is useful to know and understand these terms before using the application.

Across — Indicates the ordering of transfers to occur in a row-wise manner.

Batch — A group of plates processed through a single run of an Echo Plate Audit protocol.

Bounding Region — A region that sums all of the user defined regions.

Down — Indicates the ordering of transfers to occur in a column-wise manner.

Fluid Composition — Percentage value calculated from a comparison of the expected measurement of acoustic impedance in a 100% pure fluid and the observed measurement.

Fluid Height — Measurement from the surface of an acoustically determined well bottom to the acoustically determined meniscus of the fluid in the well.

Fluid Volume — Calculation of the fluid volume in a well using the acoustically observed fluid height and well geometry defined for the Labware used.

Optimized Region — A region that sums all the user defined survey regions with a minimum distance for the transducer movement path.

Plate Format — Defines the physical plate based on the number of wells, plate material (for example, PP, PS), and fluid capacity (for example, LDV).

Plate Type — Defines the transfer methodology appropriate for the contents transferred.

Quadrant — One quarter of the total wells available in a microplate.

Source plate — Echo qualified microplates containing samples or reagents for transfer to another microplate serving as a destination plate.

Source Plate Regions — Sub-groups of wells within a microplate.

Survey — Process involving several pulses of acoustic energy to map the location of the well bottom, fluid height, and acoustic impedance.

Whole Plate Survey — Surveys the whole plate, even if only a small region was added to the plate by the user.

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